ELECTRICAL WEST

WITH WHICH IS CONSOLIDATED
THE JOURNAL OF ELECTRICITY

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Every
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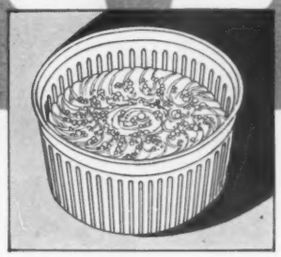
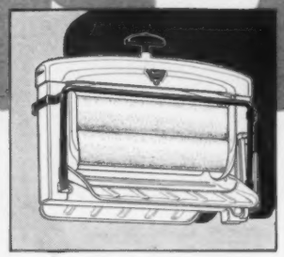
VOSS

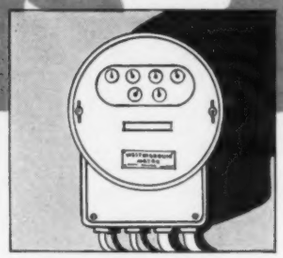
Only washer with metal Floating Agitator which *duplicates* hand-washing action.



Only washer with tub of 18-gauge *corrugated* porcelain enamel.



Only washer with Voss Safety-Guard Wringer, the first *really safe* wringer.



Lowest power consumption in competitive test of 17 leading washing machines.

Exclusive sales features

Illustrated above are the four most effective sales features offered on any washer today. And they all are *exclusive* Voss features. They are effective because every woman recognizes their importance. She *knows* she wants the gentle efficiency of hand-washing action . . . *you don't have to sell her on that.* She *knows* that a corrugated surface gives better washing action . . . *you don't have to sell her on that!* She *knows* she wants the protection of the Safety-Guard wringer . . . *you don't have to sell her on that!* She *knows* she wants a washer that costs little to operate . . . *you don't have to sell her on that!*

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THREE MODELS AT THREE POPULAR PRICES

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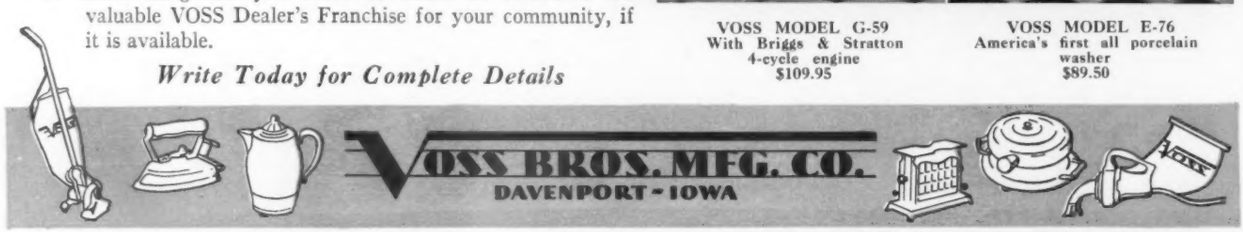
VOSS MODEL G-59
With Briggs & Stratton 4-cycle engine
$109.95

VOSS MODEL E-76
America's first all porcelain washer
$89.50



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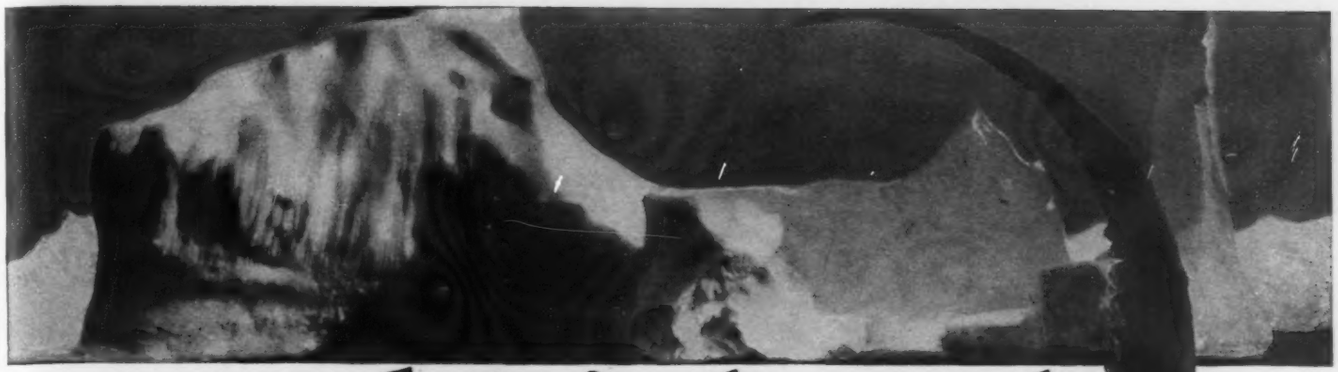
Alligators..

PYREX INSULATORS



wouldn't last long in the ARCTIC

NOR could polar bears stand the heat of the tropics. They are adapted to one extreme of temperature. A change would be fatal.

But your insulators must be hybrids. Blow hot, blow cold, they must keep your lines in service. If they *absorb* the heat of summer sunlight, the chill of sudden rain causes deterioration and line failure.

Pyrex Brand insulators *transmit* the sun's rays, for they are transparent. They do not heat up and are therefore unaffected by temperature changes. They do not deteriorate. They are the one brand of which the first cost is the last.

PYREX brand Power Insulators are available for operating voltages up to 66 kv. They are one piece, non-porous, homogeneous, one material all the way through. They have high puncture value . . . great resistance to power arcs, low temperature rise . . . a rugged, non-crazing insulator, unaffected by atmospheric conditions . . . an insulator that can be inspected clear through to the pin.

"PYREX" is a trade-mark and indicates manufacture by Corning Glass Works

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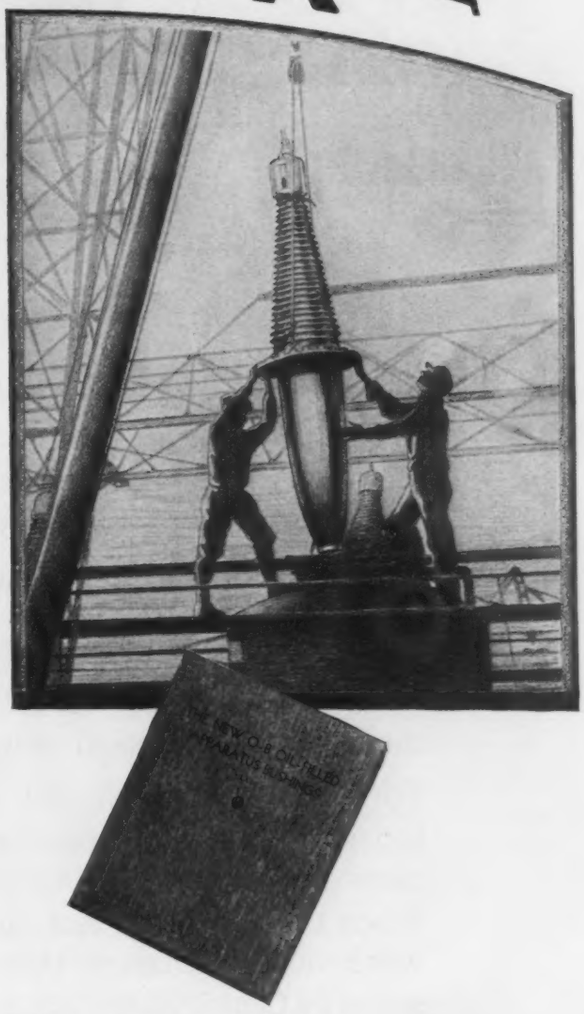
THE YOUNGSTOWN SHEET AND TUBE CO.

GENERAL OFFICES - YOUNGSTOWN, OHIO

IN THE TANK—

Never to see a Shipping Crate Again



AN apparatus-bushing is subject to damage in service. A power arc may follow a flashover, and damage the cone. It may be subjected to abnormal mechanical service shocks. Or something may accidentally drop on the bushing. Thanks to proper caution and attention in the field, cases of damage are rare. But when damaged, should it be necessary to ship the bushing to the manufacturer for repairs? Why couldn't it be repaired by company men? This would avoid time-loss, and divert shipping charges to a profitable channel.

Field repairs and the savings they afford were important considerations in designing the new O-B Class-G Bushings. The design of the parts, as well as the method of putting them together, has been kept simple. In repair work, there is no "ticklish" cementing of oil-joints. Interchangeability has been carefully provided so that new replacement parts fit readily into old places. Method of assembly assures all gaskets being compressed properly; air is entirely ejected and the joints readily become oil-tight again. The parts are purposely designed so that extreme accuracy of fit is not required, and experience in assembling bushings is not really necessary to make repairs.

For the first time, bushing repair in the field becomes practical; and an O-B Bushing, once in the tank, need never see a shipping crate again.

1552H

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Mansfield, Ohio, U. S. A.

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Sixteen pages of meaty information discuss bushings in general and the new O-B Bushings in particular. This booklet explains the new O-B compression assembly, standard flanges which simplify stocking problems, and many other money-saving improvements. The coupon below will bring for your files a copy without obligation.

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Mansfield, Ohio, U. S. A.

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1/6 Horse Power Century Type RS Repulsion Start Induction Single Phase Motor.

This Means a Lot to Motor Users

Century Electric Company started in business in 1903. That in itself means nothing. But, *this* means a lot:

The first motors that ever went out under the Century trade mark "Kept a-Running," simply because they were *built right*—right from the start. They have always been *so* right that they have been actually responsible for many advancements in the electrical industry.

For instance, they played a most prominent part in popularizing the use of motorized equipment when lighting circuits were the only available source of power . . . Again, when the Electrical Refrigerator and Oil Burner Industries were in their infancy, *their motor problems had already been solved by Century*—not with a specially built motor, but with a motor *already* so right that it met every exacting service requirement.

Many other similar instances could be cited to indicate Century's leading place in the picture of industrial development during the last 28 years. It points definitely to one thing:

No matter what your requirements are, you will profit by an investigation of Century Motors.

Century MOTORS

CENTURY ELECTRIC COMPANY, 1806 PINE ST., ST. LOUIS, MO.
Offices and Stock Points in Principal Cities

ALTERNATING AND DIRECT CURRENT, SINGLE PHASE, POLYPHASE, SPLIT PHASE, MULTISPEED AND SPECIAL MOTORS, RANGING IN SIZE—DEPENDING ON TYPE—FROM 1/60 TO 250 H. P.

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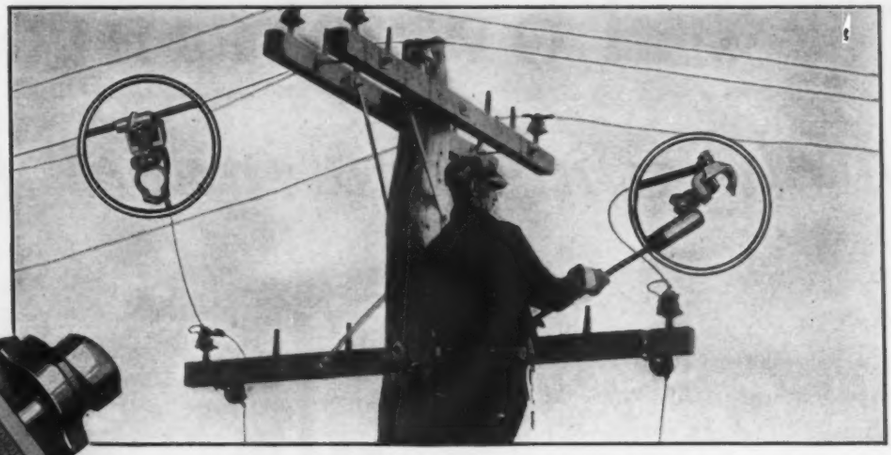
FOR MORE THAN 28 YEARS AT ST. LOUIS

SAVE TIME in Live-Line Connections



HOW much time do your linemen need to make live-line connections for temporary grounds on transmission lines, for connecting lightning arresters, and for connections during construction work? Is your method expensive and hazardous? General Electric live-line disconnecting clamps are economical and easily adapted; they provide safety for your operator and equipment because of the following features:

1. Large opening for main conductor.
   Large opening for operating hook.
   Easily operated at a distance.
2. Rigidly secured to operating hook; cannot fall off and cause damage.
3. Special operating hook unnecessary.
4. Eliminates soldered connections.
5. Strong design and light weight.
6. Corrosion-resisting parts.
7. Suitable for wide range of main- and branch-conductor sizes.
8. Finished for either copper or aluminum conductors.
9. Clamp-pressure contact for main and branch conductors. Branch conductors held by bolted V-shaped serrated contact surfaces.

Why not ask your nearest General Electric office for a copy of GEA-481C, which describes these new live-line disconnecting clamps in detail?

500-75

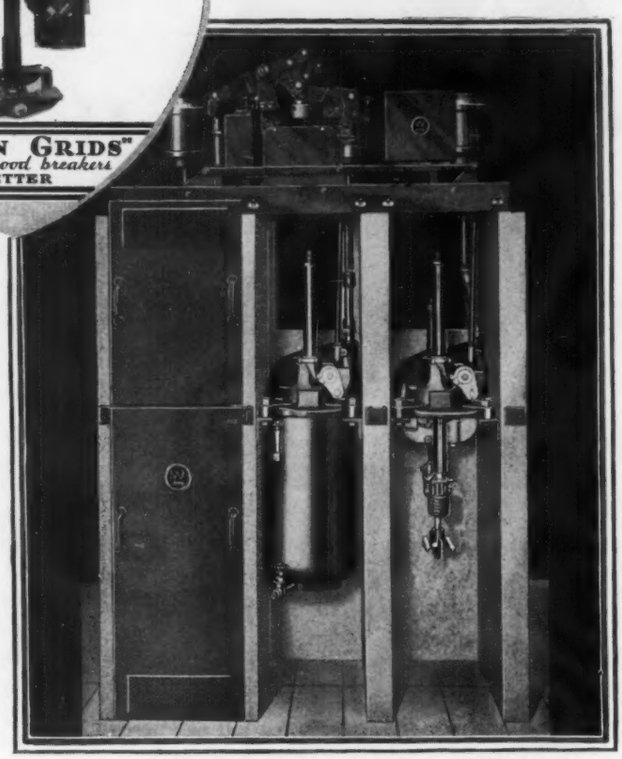
GENERAL ELECTRIC

"De-ion Grids" bring New Low Maintenance *to old and new indoor breakers*

THE new high standard of performance set by Westinghouse outdoor "De-ion Grid" oil circuit breakers can now be obtained with all new indoor, high capacity breakers up to 2,500,000 kv-a. An important feature of indoor "De-ion Grid" breakers —decreased oil deterioration—greatly reduces the number of oil changes, bringing new economies to this important maintenance item on old as well as new breakers.

Other advantages of "De-ion Grid" breakers that lower maintenance costs and improve operation of indoor breakers are:

1. Decreased arc energy dissipated in the structure
2. Decreased gas volume
3. Decreased tank pressures
4. Decreased system disturbance
5. Arc always extinguishes within the grid structure
6. Consistent performance
7. Will make possible new reclosing duty cycles



Three-pole assembly of the O-111-A "De-ion Grid" Oil Circuit Breaker, 1200 amperes, 15,000 volts.

Are you interested in increased rupturing capacity? Send the coupon for complete information on Type "O" breakers which development completes this high-capacity line.

MAIL THE COUPON

Westinghouse Electric & Manufacturing Co.,
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Please send me a copy of C. 1958 describing type "O" Circuit Breakers.

Name.....

Company.....

Address.....

City.....*State*.....EW 8-32

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Quality workmanship guarantees every Westinghouse product

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Number 2

G. C. TENNEY, *Editor*

A.I.E.E.'S Vancouver formal program may list corona losses and other technical subjects, but deeper concern will probably center, during informal sessions at least, upon the projected curve for the engineer in a cycle of impeded construction and economic phase unbalance.

▼

OREGON'S commissioner isn't waiting to make his report on the complicated Northwestern company valuation, just completed, before tackling Byllesby's Mountain States and Copco rate base studies.

▼

P. G. AND E. and Standard Oil exchange pleasantries preparatory to submitting a proposal to the California commission whereby Coast Counties Gas & Electric will be merged to its supplier.

▼

J. D. ROSS has joined the horde of bridge, water district and other public project advocates at Washington. He asks R. F. C. to loan Seattle $3½ millions to finish Skagit.

▼

LOS ANGELES' Power and Light Bureau has troubles. Huntington Park refuses its right of way for a 132 kv. line. Edison company argues it should not build its long-yearned-for steam plant.

▼

A FRIENDLY critic sets forth some constructive ideas, points to some illogical discriminations in commercial rates. (See page 56).

The Month

WINDOWS are silent, yet highly eloquent salesmen, but they must be carefully groomed to tell their story over a widespread and far from uniform system of commercial offices. (See page 60).

▼

MANAGEMENT'S three-phase balancing job is analyzed by an engineer-manager who evaluates the phase angles and the loads each leg must carry. (See page 54).

▼

METERS have long been the measurers of revenue, but meter studies themselves become profitable by pointing new ways to economy. (See page 68).

▼

CHALLENGER Diesel Engine and Champion Electric Motor are weighed in so that their respective chances may be determined in the contest for Western power contracts. (See page 70).

Editorial

Broader Opportunities For the A.I.E.E.

TECHNICAL contributions always characterize A.I.E.E. conventions. That which opens on the last days of this month will be little different; hydro-electric costs will be analyzed, modern substation equipment will be discussed and new developments will be described in the fourteen papers which constitute the chief interest of the convention.

But there is a larger task to which the gathering might well give study—the extension of engineering thought to the problems of business, political and social life. Now, engineering thought, which at best is different from any other thought only in method, cannot cure the complex ills of the nation. It is the engineering method, of penetrating logic, exhaustive analysis and consummate study, that is needed.

Engineers have built great bridges; can they build a better distribution system to bridge the gap between production and consumption? Engineers have erected great electric systems; can they help build a better economic system in which cycles will play a smaller part and in which the peaks and valleys of the business curve will be smoothed out? Economists have failed. Engineers have solved natural problems; can they solve the unnatural, politico-economic problems on which our statesmen, financiers and economists are stumped?

Engineering progress is assured. The time is at hand when the great professional engineering organizations should exert their influence toward orderly economic progress.

Self-Interest In Sales

"WHAT DOES business and industry need most today?" And echo answers, "More sales". Even the rank and file of employees are beginning to appreciate that their jobs, their futures, depend upon sales of the service or goods produced by their organization. The problem today is to impress this idea so indelibly upon the consciousness of every member of the organization that each becomes a member of the sales force.

That this can be done successfully has been demonstrated in individual instances in the electrical industry. Westinghouse, in a nationwide campaign, welded its entire personnel into a sales force that produced a total volume of $2,750,000 in appliance business in two months. One California power company has translated new load into terms of man-hours of employment. Thus, every employee is shown that his ability to uncover new prospects for business will be reflected in more work for him and for his fellows. The resultant stimulus to sales enabled this utility to exceed quota in its last load-building campaign.

This is simply the application of the time-tested theory of self-interest. Its adoption by the entire industry would start a far-reaching chain of operations. One new motor or new range gives employment to a contractor, clerks, truck-drivers, linemen. Its use requires facilities reaching to mountain stream, coal mine or oil well. Add a sufficient number of new ranges, new motors or new lights, and a different chain starts. Engineers plan, men in dozens of occupations begin working, factories begin to fabricate materials, miners burrow in the earth for copper. Finally, a new power house is built. Thus does the self-interest story of sales function in the electrical industry. Here is justification for a united drive for "More Sales".

Wishing Won't Bring Back Prosperity

INCONTROVERTIBLE evidence that America's resources and wealth form a foundation for a future richer than any past era was presented in a recent editorial in "Collier's". It is worth reading and then rereading. After that correlate the following specific facts about the electrical industry in this territory with those that magazine offers about the nation in general.

In the 11 states west of the Rocky Mountains, there are 3,263,730 electrical consumers.

With 9.8 of the population of the United States, this region contains 13.2 per cent of the total electric customers, uses 17.1 per cent of the energy generated and pays 12.5 per cent of the nation's electrical bill. These figures reflect a higher degree of electrification, higher per-customer energy consumption and generally lower energy rates than for the country as a whole.

In this area there are 2,554,811 wired homes. We say "wired" with certain reservations, for fully 85 per cent are totally lacking in facilities for any other electrical use than lighting of the most meager and inadequate character. Of these homes, 87 per cent are without electric ranges, 86 per cent without mechanical refrigeration. Figures

for other electrical appliances show equally great market possibilities.

There is available to serve this territory 4,627,732 kw. in power house capacity. For the last eight years there has been an average annual increase of 350,000 kw. In the face of a national decline of 12 per cent in plant output, the average decline for the Mountain and Pacific states for the first six months of 1932 has only been 9 per cent.

Within the last thirty days, two power companies have completed load-building campaigns in which quotas set at the beginning of the year have been exceeded.

One Pacific Coast utility, Pacific Gas and Electric Co., recently sold $5,000,000 in 6 per cent preferred stock at par in five weeks to 7,000 subscribers at an average cost of less than 20 cents per $100.

If more evidence was desired, it would be possible to fill other pages with similar proof of the soundness of this industry.

So let's stop trying to figure out how, in the face of such facts, the electrical business can be in the shape it is in today. Let's resolve to stop sitting around in utter bewilderment, wondering when something is going to happen and what that something will be. Let's resolve to quit thinking and talking about new economic eras, the breakdown of the capitalistic system and other equally useless hysterical and silly ideas. Let's quit hoping and wishing for some mystical and magical substitute for WORK.

Criticism May Be Turned To Good Advantage

A CHILD at play with a toy hurts himself with some misapplication of its mechanism. Rather than seek the cause of his misfortune, he either squawks loudly in abused bewilderment or, childishly angry, kicks the object which has caused him pain. A child has not the developed intelligence which would tell him why the toy went wrong. So, angered, he destroys rather than seeks the cause. Possibly his own neglect or carelessness was the chief fault.

In a time of economic stress, men, machines and institutions are put to unusual strains. The well-oiled systems, mechanisms or organizations that worked well enough in the past have not been able to stand up according to the new needs. Consequently, critical eyes have been turned upon them, searching for symptoms which will tell why the mechanism suffers.

At the present time the electrical industry particularly seems to be made the object of such scrutiny. Criticism comes to it both from within and without the industry.

It may be human nature to become angry at the critic or analyst, but, after all, doing so will not cure the defect of which he complains. The intelligent thing to do with criticism is the intelligent thing to do with any research operation; there are certain fundamental questions which should be asked of it.

First, is it sincere and, hence, can it be taken at face value, or must a bias percentage be applied to it?

Second, do the things of which it complains exist as a whole or in some detail?

Third, to what extent does any particular criticized detail affect the soundness of the whole?

Fourth, can it be corrected with benefit to the mechanism, organization or economic system with any degree of success and, if so, are the effort and other consequences from such a move worth expending for the results to be achieved?

In such an intelligent spirit, no criticism can hurt. It can only strengthen and improve the person or thing criticised. Certainly the ills of the present era deserve an intelligent handling of criticism. Otherwise we will go on pinching our fingers upon the toys of our civilization, and bellowing because we are hurt.

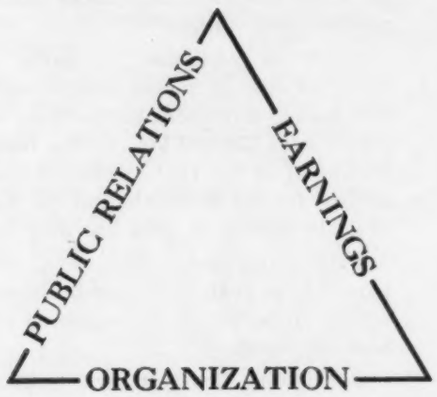
Let's All Be Exceptions

STANDING OUT like giant Sequoias in a forest of second-growth pine are individual business concerns which, even today, are progressing, with sales and profits increasing. "Depression-proof", their competitors say enviously; others claim they are the exceptions that prove the rule.

Careful analysis and study shows otherwise. "Resourceful" describes them better. In some instances precedent is being broken, tested experience thrown overboard. In others, ideas attuned to the times are being applied. In every instance there is plenty of good hard work.

Study of actual cases of this character reveals one basic fact—fundamentally, the principles involved may be reshaped and applied to almost any other business. Each and every concern in all branches of the electrical industry can profit from seeking out these successful organizations, studying them and taking from them those practices and ideas applicable to their own operations. By so doing they, too, may join today's charmed circle.

Utility Management—A Three-Phase Problem



By F. B. LEWIS*

Vice-President and General Manager, Southern California Edison Co., Ltd.

PUBLIC UTILITY management may be likened to a three-phase delta connection. Each of the phases have the same weight; each of them must be considered in its relation to the other two, and a disturbance in any one of them will have a noticeable effect on the operaton of the others. The three phases are—public relations, earnings and organization. If you will make a mental chart of these, as an equilateral triangle or delta connection, it will aid in the few observations which are to follow.

Public Relations

Many attempts have been made to get an accurate definition for public relations, but I have found none that suits me better than this: "Public relations means so conducting a business that everybody is satisfied." At first, our business had no more public relations problems than any other infant; they have been acquired as we have grown up and taken our place in community life. Some utilities have not been sufficiently self conscious to sense conditions which later develop into public opinion unfavorable to the utility. Others have been able to indulge in self analysis, and have kept criticism within bounds, but I think that we will agree that no public utility has been able entirely to avoid external disturbances in this phase of operation.

The obvious procedure, then, is to consider these disturbances with an open mind, to determine their cause and then look about for methods which will correct them.

There are only two elements in public relations—service and rates. Accordingly, management should ask itself two questions: First, is anything wrong with our service? And, second, is anything wrong with our rates? A survey of public opinion, as given voice through newspapers and speeches of critical observers, discloses virtually no complaint about service. Hence, it would seem for the moment that any problem of public relations now confronting the management of our utilities is confined to the matter of rates. I am of the opinion that public utility operators should give careful study to their rate structures, so that the cost of service to the consumer may be equalized, giving due consideration to all of the factors, some of which are not understood by those who, from the outside, are suggesting changes. The next step is more difficult as it involves explaining to the public the why and wherefore of the price we ask for our service.

There would be less criticism about our rates if we also could furnish itemized statements. The bill for domestic service then should read as follows:

240 slices of toast	15 c.
180 cups of coffee	12 c.
Cleaning rugs four times	2 c.
Washing and ironing five times	20 c.
Attending ball game by radio	6 mills

The bill to the agricultural consumer should read: "Water for 100 tons of alfalfa, $48", and the bill for the manufacturer would read: "Power for sewing 2,000 shirts at 1.75c. each, $35."

It would be difficult to devise a meter which would record our service in such units, but, in all seriousness, I suggest that in our personal contact with customers, and through our advertising, we should interpret kilowatt-hours in terms of the consumer's use. This has been tried in isolated instances, and always has proved satisfactory in meeting a criticism about rates.

Earnings

Some things are so elemental that we hesitate to mention them to intelligent people, but sometimes this cannot be escaped. There are only two methods of increasing earnings or profits—by extending our market or by economies effected within the organization. The latter method has attracted the attention of utility operators particularly during the past few months, and rather remarkable results have been obtained where the wits of an entire organization have been concentrated on operating economies. In this connection, I would suggest that utility opertors take their entire personnel into their confidence and show them how the dollar obtained, through economy, is just as valuable as the dollar coming from new business.

It has been my observation that employees have difficulty in discriminating between operating and capital expenditure, and that, when they do see the difference, they are inclined to look upon capital accounts as a hiding place for expenses, because they think that the dollar which goes into capital does not mean an operating expense. A department head might order a new typewriter to be charged to capital, whereas, under the stress of economy, he would not requisition a new typewriter ribbon because it represented an operating expense. When he understands that every dollar in capital has a carrying charge of about 10 cents, his attitude will be changed, and such consideration, when multiplied by millions of items and thousands of employees, will have a direct bearing on earnings. Eventually such economies will reach the consumer, and that phase of our system which we have called "public relations" is improved.

Referring again to our triangle, it will be noted that, no matter how we turn it, each phase is in contact with the other two. As we speak of earnings, we see that it is bounded on one side by public relations and on the other by organization. Management must recognize

* Extracted from an address before the Pacific Coast Electrical Association, Pasadena, Calif., June 17, 1932.

both of these when looking at the matter of net income. It is my opinion that rate reductions, when possible, should come voluntarily from the company, and when economies have been effected in large enough volume to have a bearing on rates, they should then be passed along to the consumer.

Furthermore, a proper understanding of earnings will enable management to employ a certain degree of selectivity as it looks about for new business. Management is neither an engineer nor a salesman, yet at times it must be both. Undesirable business is sometimes taken on the line through the enthusiasm of a sales department, and it is true also that desirable business is sometimes delayed through the sincere but biased views of the engineer.

I have this further comment to make about earnings. When an honest service has been rendered, and an honest dollar has been earned, it belongs to us. We have a right to our honest earnings, and we should not hesitate to defend them. At all times, we should be willing to listen to fair criticism; we should make such adjustments as are advisable and possible; we should recognize that any customer has a right to discuss his relations with us; we should make every conceivable endeavor to improve our service and reduce our rates; but when all of this has been done, we should be entitled to our net earnings. Unreasonable efforts to invade our property rights, to dissipate our resources, or to attempt encroachment contrary to the public welfare, should be resisted.

This discussion of earnings cannot be dismissed without a passing comment about taxes. I need not remind you that taxes at present take more than 10 per cent of our gross and represent about 42 per cent of our operating expense, nor need I remind you that there are agencies operating at present that, if successful, may still further increase them. As a citizen, the public utility should accept its share in the course of government, and no one is justified in maintaining that reasonable government functions be in any way restrained; but here, as in the case of earnings, we have a right to express ourselves. As citizens, we should not be denied the privilege of demanding from government the same effective management, the same grade of efficiency, the same accurate accounting, and the same useful service that government, through its agencies, demands of us.

All that I have had to say about earnings may be summed up thus: To secure net earnings, we must make both ends meet and have a little left over. That is a simple statement. Most problems are capable of being stated in simple terms; their solutions puzzle us.

Organization

We cannot escape from our chart as we prepare to discuss the third side of our triangle, that of organization. We immediately notice that it is limited on one side by earnings and on the other by public relations. If we were using the historical method, we might say that organization comes first, but the minute a particle of service is rendered, or a cent of revenue is received, the other two phases are to be reckoned with. If 10 men were given the subject of organization and made an impromptu address about it, each would approach it from a different angle and a great variety of views would result. At least one of them would use the illustration of the cogs and the wheel; another would choose the hub and the spokes; another would liken it to a great family; another would use a military analysis. One man would emphasize loyalty; another, efficiency; another, public spirit. Management must recognize all these and many other characteristics of organization. Organization, more than any other element in business, has the power to create a going concern's value.

Organization is like power factor: It may be allowed to lag, or it may be encouraged to lead. I have seen organizations where a few synchronous condensers could be used to advantage. Unlike some of the elements in management which we have reviewed, organization is almost entirely within our control. It means not only the right man in the right place, but the proper balance between department and department, with just enough personnel to do the day's work, but always maintaining reserve power against an emergency. I am old fashioned enough to believe that everyone should have plenty to do, and I feel that nothing can be gained by a system which encourages idleness in any form, either among men or machines. Men are like generators; their efficiency is greatest at full load. But at the same time, I also maintain that nobody should be worked beyond his strength or his capacity, because fatigue, worry and uncertainty are sure to result in expensive mistakes. It is true that the laborer is worthy of his hire, but it is equally true that management is entitled to its money's worth. A proper understanding of these two simple elements is about all that is necessary to prevent labor troubles.

The obligation of giving constant service makes organization of preeminent importance in the electrical industry. I rather expect to wait a few minutes when I go into a barber shop, but when I flip a switch I expect instant response.

Recent events have forced management to give more consideration to organization, with beneficial results alike to management, the employee, and the public. I believe that, right now, our employee has a higher appreciation of the value of his job and management has a greater regard for the skill and loyalty of its worker than ever before.

Organization means more than men and women. There is, for example, the matter of budgets. A budget is merely management's recipe for making a cake; if the ingredients are in the wrong proportions or incorrectly mixed, if the control of baking is inaccurate, if there is the slightest departure from the original plan, then disappointment is certain.

A budget is not complete until every possible development has been considered and every move planned. If we can budget our dollar of expense before it is spent and our dollar of revenue before it is earned, and then route them through the path of least resistance to the ultimate goal, we then will have a budget which will be more than figures on a piece of paper.

Needless to say, the influence of organization upon public relations, for either good or evil, is almost beyond comprehension. This has been emphasized recently when all companies were having some difficulty with collections. The fact that so many bills have been satisfactorily settled with distressed consumers, with a minimum of ill feeling, is due not to management, not to policy, not to regulation, but to those men and women who for the moment we are integrating to compose this impersonal thing which we choose to call "organization". They are not cogs in a wheel; they are human beings who impart to the public utility industry whatever of human attribute and characteristics it has attained.

Thus our triangle is complete; as it stands now, an organization of loyal men and women forms the base, with public relations and earnings taking the two sides. My three-phase triangle was used merely as an analogy; after all, any problem of utility management cannot escape the recognition of people, and people (men and women) have an infinite capacity for resisting the scientific approach.

Electrical Rates As Viewed by the Consumer

By LOUIS F. LEUREY
Consulting Electrical Engineer, San Francisco

An Appeal for Simplicity, Closer Understanding and Modernization of Rate Structures by an Engineer Who Is Familiar with the Viewpoints Both of the Customer and of the Utility

IN SPITE of universal desire for simplification, the art of electric rate making always will constitute an intricate and ever-changing process. Were it possible for all public utilities to wipe from their records all past and present rate schedules and take a fresh start, many desirable improvements could be accomplished. Unfortunately, power companies, public service commissions and consumers are hedged about with the history and tradition of rate making, with the result that nearly every attempted betterment ends in a modification of some existing rate, rather than a clean-cut attempt to build a new and better rate.

The fundamental requirement of rate schedules is the production of adequate revenue, and this can be accomplished with greater surety where rates maintain their old form and their yield can be predicated on accumulated record of the past. If the production of revenue were the only consideration, rate making would be a very simple process, indeed; but many other factors must be given consideration, with resultant schedules that attempt to distribute the rate burden fairly as well as produce the revenue desired.

Cost and Value of Service

One of the fundamental principles that underlie rate making is that rates should take such form for each class of consumer that no one class shall receive service below cost.

Many attempts are made by special groups of consumers (and sometimes these attempts are successful) to secure rate advantages which result in their receiving service below cost. This is one of the vicious practices which sometimes interfere with proper rate making, and the result is not only unfair to other users, but actually results in loading the public utility with an excess of unprofitable business. Profitable business that might be had from a more equitable distribution of the rate burden is thus curtailed. This special pleading by minority blocs before public service commissions is taking on a bolder aspect each year and at present many of them plead openly for special rate consideration on the ground that their business is unprofitable and should be subsidized.

The natural reaction to such a practice is the organization of other classes of consumers into defensive blocs, which in time will tend to produce in rate making the same condition of minority pull and haul that we see in our federal legislature. The major function of consumer representation should be the accumulation and presentation of evidence as to the character and conditions of electric service in that particular industry. All consumers have a right to feel that with the public service commissions alone rests the responsibility to determine a fair rate of return and the equitable distribution of the rate burden to the various classes of consumers.

The value of the service to the consumer is a principle that must be given consideration in any proper balance of the public utility rate structure, but the application of this particular principle produces more tonnage of "hokum" than any other phase of rate making. Every type of consumer with an ax to grind tries to prove to the power company and to the public service commission that the value of the service to him is very small and that, if the rates are not lowered, he will be forced to adopt one or another of the various types of substitute services which he claims are available.

As a matter of fact, most of the exhibits and arguments developed to show the low cost of substitute power are so ridiculous as to be laughable, were it not for the fact that in too many cases actual weight is given to this fictitious material. Most of these exhibits are prepared by handbook engineers or statisticians who have no knowledge of the design or operating principles involved in a substitute plant. They throw together a mere collection of hand-picked data, plus material from manufacturers' catalogs, which to the uninitiated may seem convincing, but which will not stand up under the searchlight of rigorous analysis.

There are, however, actual conditions where either or both by-product and primary manufacture of electrical energy or of equivalent mechanical energy are true competitors with the power company, and in these cases serious consideration must be given to the value of service in the rate structure of the utility.

Promotional Rates

The theory of promotional rates is based on the belief that any public utility can take on a limited quantity of business at lower than usual rates where such promotional rates result in the addition of new business that otherwise would not be available. There is little question but that this is a sound factor in general rate making and, when guided by correct judgment and supported by accurate analysis, it constitutes a benefit to all classes of rate users as well as to the power company.

In many cases, however, the so-called promotional rate represents little more than the zeal of the commercial department of some public utility company to make a show of increased business; these campaigns often are conducted without proper analysis and with no check by which the volume of business can be limited. In many cases after the business has been secured and found to be unprofitable the rate continues to promote undesirable business for the utility and unfair distribution of rates for other classes of consumers.

No consideration of public utility rate structures would be complete without considering the historical

background from which they have developed. In practically every case there has been not one but several parallel paths of development. One of the most important factors is the gradual increase in size of the utility, the original rates having been designed for small users and occasionally amended with the growth of individual consumer load. In many cases, however, rates have not kept pace with the change in consumer characteristics, and we see rates designed for 6,000 kw.-hr. per month loads being applied to loads of 200,000 kw.-hr. per month.

Another factor in the historical development of rates revolves around the early use of direct current for elevator and general power service and its consequent adoption for lighting service. In commercial building, this type of service, originally necessary for physical reasons, has been rendered practically unnecessary today by the development in medium-speed alternating current elevators and the Ward Leonard type of motor-generator control for high speed elevators. The result is that power companies now are forced to limit the service of direct current and to discourage its use through rate penalties and by other limitations permitted by the public service commissions.

A third historical development vitally affecting rate structures has been the continual technical improvement in the service of light and power over the same service wires. In the initial developmental stage of public utilities the requirements of lighting were so exacting, with the crude equipment then available, that independent service had to be maintained. Today, regulation of light and power is so successfully accomplished that no difficulty is experienced in serving light and power consumers from the same facilities. The development of alternating current network distribution rapidly is wiping out all physical distinction between light and power, leaving only the fiction of difference to be embalmed in the rate schedule.

Consumer Reaction to Rates

Those consumers whose point of view is outlined here are of the commercial and industrial classes. They operate buildings and businesses of various types, usually are well informed on business practice and have a fair knowledge of physical plant. The frame of mind of these consumers as to their purchases of electrical energy may be classified as follows:

They think that most rate schedules are too complicated and generally throw up their hands without making much attempt to understand them. This reaction results from a number of causes. Possibly the primary cause is the attempt to make some rate schedules too "all-inclusive." This necessarily burdens such a schedule with many special conditions and clauses, all of which have to be studied as a whole before the schedule can be interpreted and applied properly.

As an illustration, the general power rates in effect in California cover every size and type of power consumer, both industrial and commercial, with many special clauses that often lead to misunderstanding on the part of consumers. A notable example of this is the clause entitled "Optional Rate for Larger Installations." Very few consumers understand this clause and consequently few of them, unless advised by engineers or the power company representatives, take advantage of it in the proper manner. The writer found one industrial company making a regular practice of throwing on all of the motors in its plant the last two days of the month in order to create a demand which would put them in the next larger block of the power rate, whereas all they had to do was to call up the office of the power company and guarantee the next block.

Whether warranted or not, this unfavorable reaction will always be had from consumers where rates become burdened with too many contingent clauses.

Many consumers have a very definite objection to two-part rates, where the demand charge stands out as an individual item of cost and the energy charge is added. Even where careful explanation is made, it seldom succeeds in removing their objection to this form of rate. On the other hand, they have no objection to a load factor form of rate where the same object is accomplished by including the demand factor in the rate block. As business men they realize that low load factor must bear the penalty of higher costs, but they strongly object to a form of schedule that seeks direct payment for the mere readiness to serve energy.

Consumers believe that "class" rates are deliberately unfair and discriminatory; as one consumer puts it, "They make me pay one rate for current used for my lights and another for current used in my motors, while all the current comes over the same wires . . . it seems just the same as the water company asking me to pay one rate for water for drinking fountains and another rate for water used in wash rooms."

These consumers are not interested in the theory of class rates nor in the historical background that produced them. They are realists who are asked to accept a fiction in purchasing electric energy which they are not asked to accept in the purchase of any other service or commodity.

They understand and are in agreement with the necessity for minimum charges in rate schedules, but they are suspicious of demands and demand indicators. Very few consumers question the accuracy of a watthour meter because they have their own rough methods of check by hours and conditions of use, but in many cases they believe the demand indicator to be a sort of electrical roulette wheel that chance alone brings to a varying monthly stop with the percentage usually in favor of the "house." Few consumers realize that the demand indicator is merely a 15 or 30 minute "vernier" for periodically recording the rate of flow through the watthour meter. Utility operators should take the trouble to explain to consumers that the demand reading actually covers "highest average use" rather than "highest momentary peak."

Much of the misunderstanding on the part of commercial and industrial consumers often results from poor contact between the power company and the consumer; the by-product of this poor contact often is dissatisfaction and sometimes distrust of the utility and its personnel.

This condition can be bettered in several ways:

1. By employing specially selected men to contact consumers.

2. By a campaign of education designed to furnish consumers with understandable information on electrical measurements and rates.

3. By cooperating with consulting engineers who represent industrial consumers, or groups of consumers. These men are especially well equipped, from their knowledge of the requirements of both parties, to act as proper liaison officers between the utility and the consumer.

Future Rate Trends

After giving consideration to the many factors that influence rate making as indicated in the foregoing analysis, I wish to recite what in my opinion should be the rate policies that will produce the most favorable relations between the public utilities and all classes of consumers.

1. Clarify the language of rate schedules by elimi-

nating technical language, or explain to the layman the meaning of this language by the use of interpretative footnotes.

2. Where a schedule becomes top heavy from special clauses and options, it would seem the better policy to replace it with two schedules of simpler form.

3. In addition to schedules for lighting only and for power only, there should be combination schedules to cover the requirements of consumers who purchase both light and power at the same locations. This may well be accomplished by a load factor schedule which would equate the average requirements of light and power in a single structure.

4. Schedules should be kept abreast of the changes in size of loads and of the technical advances in the distribution of light and power.

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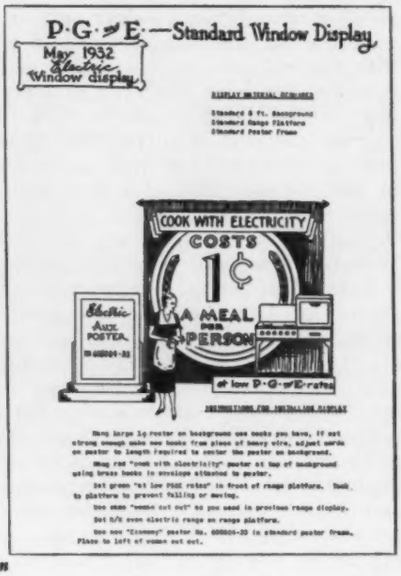


Second of the campaign displays magnifying the appeal previously featured on two sizes of cut-out cards for range or counter display — the "penny per person per meal slogan", stressing economy. At right, the direction sheet for setting up the display

Organizing the Silent Salesmen

Window Displays Never Speak Out of Turn, Always Say What You Want Them to, All Tell the Same Story Even Though Miles Apart and Constitute the Last Link in the Long Chain of Advertising

Prior to the opening of the campaign, Dad was brought in by means of this large cut-out, and equipped with a real kitchen apron. Accompanying this was a poster which read "Daughter's cooking rivals Mother's, and costs 1 c. a meal per person, thanks to the electric range"

PRESUMABLY, every type of merchandising business had to go through a certain evolutionary process to arrive at its present day technique. A late starter in the game of selling, the electrical business has been slow to pick up the fine points of display which characterize the merchandising in, for instance, department stores.

With the power company, this likewise has been true. Offices were established for the convenience of paying bills. They had front windows in them as a matter of course, but often these were more like bank windows than those of the ordinary store. Window display, if at all, was indifferent and amateurish.

The history of how the Pacific Gas and Electric Co. system windows finally have evolved into a well-coordinated, syndicated chain of selling displays, both for the utility's products and for those of the dealer and the trade, is very much bound up in the history of an ex-showman drug clerk. This clerk faced two alternatives, that of rolling pills for the rest of his life or of transforming his drug store into the merchandising mart most drug stores since have become—a selling jack-of-all-trades, carrying everything from pituitarian gland pills to pockets knives and picnic plates.

Frank Bevan, the clerk, applied some of his showmanship instinct to merchandising. Later he became a lighting unit salesman, then a lighting salesman, then went to the main office of the power company to direct

Alcove in attractive kitchen colorings, demonstrating lighting too, used in exhibits at fairs and food shows and accompanied by a poster listing the range as one of the "appliances by which modern woman is released from the old fashioned rigors and terrors of heavy housekeeping"

lighting activities. All this is related to his present job, that of directing a syndicated window display system to cover the 77 offices of the Pacific Gas and Electric Co. It is one of those "individual initiative" stories of which utilities rightfully boast, for Mr. Beven has nothing if not initiative and invention.

As a lighting salesman in Marysville, Calif., Mr. Bevan found it necessary to demonstrate window lighting, so a model installation was placed in that office. The company had light to sell. But when the model was lighted, the next defect revealed itself; the window contained nothing worth lighting. A haphazard display of electric or gas appliances with price tags and any window card that was handy constituted the selling message of this important commercial enterprise, the utility. It was incongruous; engineers would have called it "lagging".

Then came an occasion when an attractive range display was placed in the newly lighted window. A young couple, on their honeymoon trip from Atascadero, passed the display one night and bought the range the next day. Atascadero is many miles south of the southernmost boundary of P. G. and E. territory, so the window had reached out in the night and brought in an unsuspected prospect to make a sale.

All of this is background, the details of which are interesting but lengthy. Today, the situation is uniformly better in every district office, with the consent and enthusiasm of each office, and the selling story of the company is joined intimately together with all of its advertising. For instance, when the sales department concentrates on an electric range campaign, newspaper advertisements, bill stickers, truck banners, billboards, broadsides and window displays in all offices tell a coordinated, consistent story.

Windows in the 77 offices vary in size from 6 ft. to 17 ft. of glass; no two are alike. Hence the display system had to be made to fit and to be effective under a variety of conditions. At present, each window in each office has a new display every 30 days. If it is gas territory, the display is for gas only. If it is electric territory, an electric display is used. If both are sold, there is a display for both. The company's executives know at all times that every window in the system is working, is telling exactly the same story, is not obstreperous or forward, but is well dressed and logical in appeal. It is the final selling link in the advertising chain. All other advertising tells what and where it is; the window says, "Here it is".

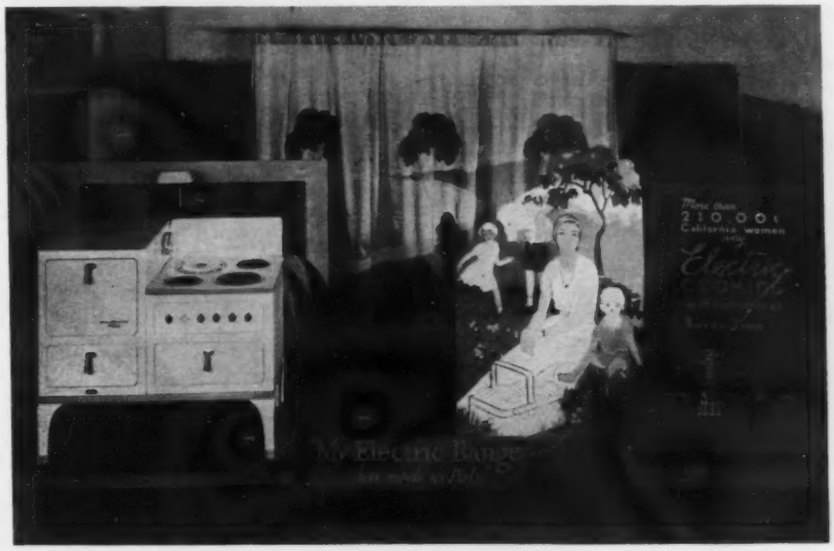
Two classifications of windows are made. Class A windows are large enough to take a full display. Class B windows take only the standard poster frame and are supplied with the monthly Velvetone poster.

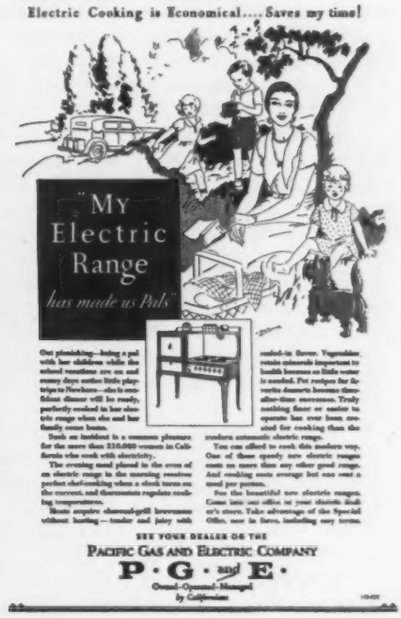
Each Class A office is furnished with a wrought iron rack and a velour background (one side russet, the other green). These are 8½ ft. wide and 6½ ft. high. They make a backing for the usually open window and also mask the back of the display from the interior. Each office is furnished with a special range platform, 5½ ft. by 3½ ft., painted green. A set of three platforms, each 10 in. high and 2½ ft. wide but varying in length (5 ft., 4½ ft., 3½ ft.), are covered with russet felt and offer a variety of uses. The tops of these platforms are removable and can be recovered with new felt. This is a detail of maintenance which is important.

Each office is provided with a poster frame made to accommodate a 44 x 28-in poster. Occasionally, special items are furnished for an unusual display, such as the alcove used in the range campaign, the cut-outs of men or women, and the rayon backdrop used in the last range display.

With each month's display material, which is shipped

How company advertising and window display tied together is seen in the display below, the final one of the three months' campaign




Electric Cooking is Economical.... Saves my time!
"My Electric Range has made us Pals"
SEE YOUR DEALER OR THE
PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·

from the main office in San Francisco, goes a display sheet with a sketch of the desired finished display, a list of the materials furnished and directions for setting it up. These have been received enthusiastically by district offices and it is remarkable how well these displays are assembled and adapted to the many windows.

All of the display cut-outs, posters and assembled material are finished in the Velvetone process, employing washable screen paint and having the advantage of being able to be used to turn out a quantity of exactly identical pieces in several colors at a reasonable cost. Moreover, the process may be used either on cardboard, wall board, paper or cloth. It is durable and extremely flexible.

Mr. Bevan works out a rough idea of the display. This is taken by the artists and evolved into a design which, when satisfactory, is stenciled on silk mesh, printed for each separate color in paint and restenciled for the next color. Register is perfect because all the work is done on one mesh frame. After printing thus, either on the cut-out material or on cards, the pieces are assembled, boxed and shipped to the district offices.

One particular display deserves more description. When the electric range campaign began, Mr. Bevan sought for some range treatment which would be natural. Previous displays, even in department stores, offered little to imitate. After all, what the company wanted was to create new users of electric cookery, prospects whom anyone in the trade might sell. Why not place a range, then, in its potential environment, the kitchen? The passerby should be able to say to herself, "That's something like my kitchen".

Since a full kitchen, obviously, was out of the question, an alcove, resembling a corner of a kitchen, was devised in cut-out, knock-down form. Attractively colored, it made a brilliant setting for the new electric ranges. Then it became apparent that the floors of offices in which this would be displayed were not uniform, nor of the right color scheme, so a floor section, 4 x 6 ft. in size, was prepared. The company at the same time was featuring a new kitchen ceiling, indirect-lighting unit, so, without mentioning it specifically, one was installed, and an ivory ceiling piece added to the alcove for good reflection surface.

Fortunately, this alcove display is so universal in its application that it makes an excellent piece of equipment for each district office to keep on hand. It has been used to good effect in a number of electrical shows and fairs and is adaptable to the display of any other kitchen equipment at a later time. Dealers, too, may use it by arrangement.

Last of the electric range campaign series of displays was a glorification of the newspaper advertisement used about the same time. To the black and white drawing illustrating "My Electric Range Has Made Us Pals" was given rich color. The rayon background shimmered in a flood of sunlight. The cut-out of the woman and her children picnicking was also floodlighted. The attractive "cause of it all", the electric range, stood out in so attractive a light that L. J. Brundage, division sales manager at Sacramento, wrote to Mr. Bevan the following eloquent testimonial of the pulling power of the display:

"The new electric range window is a 'knockout'. The first day it was in, a woman that was never interviewed as a prospect walked right in and bought the range that was in the window. She said, 'It looked so nice'. Yet we have had similar ranges on the floor for months. The window trim put it over".

In this incident there was an echo of that first range display in Marysville which brought in the honeymooners to buy a range. But more to the point, the tribute is eloquent for several very significant points. It drew an unsuspected prospect into the store. She bought the range because "it looked so nice" and not because it was cheaper. No technical reason prompted her purchase. It is to be noted also that the displays make use of all makes of ranges in rotation, and that the copy used is creative of business for the dealers as well as the company.

Before this system began operation, the cost per trim varied with local conditions and the elaborateness of the display used. Now, due to syndicated display, the cost per trim is considerably less. In addition, the entire company knows what is in every window, knows that it coordinates with all of the sales effort and advertising of the company, and knows that, **at the point of sale**, the window gives the final touch of color and life that brings customers to the purchasing point.

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Another Lamp Fable Exploded in Test

CLAIMS of salesmen for a foreign make of incandescent lamp, called the Duratest lamp, definitely were disproved in a recent test installation at the H. Liebes & Co. store, San Francisco. These claims were that, for a given lamp wattage (200 watts, for example) the foreign lamps would give twice or three times as much light as Mazda lamps, even in old reflector equipment.

True economy in lighting is based upon (1) illumination produced by the lamps, (2) wattage consumed, (3) life of the lamps, (4) consistency of performance, and (5) cost of the lamps.

H. Liebes & Co. were considering the advisability of using two sizes of these lamps. These were a supposed 25-watt tubular show case lamp, and a supposed 200-watt neck-silvered, bowl-frosted lamp. The 200-watt lamps were labeled, "200 watts, 115 volts, resist up to 130 volts".

On wattage tests the 25-watt tubular lamps consumed 60 watts. A 25-watt Mazda lamp tested at the same time consumed its rated 25 watts. The 200-watt Mazda lamp likewise consumed 200 watts, but the Duratest lamp consumed 220 watts.

To make the illumination tests, two windows were selected side by side. Each window previously was equipped with 12 deteriorated show window reflectors, on 12-in. centers. In one window, shown in the illustration at the left, a 200-watt Duratest lamp was placed in every other of the original reflectors, a total of 6 lamps. Presumably, if the claims made for the lamp were correct, these lamps would be as effective as Mazda lamps in new reflectors, so the other window was fitted with new X-Ray show window reflectors and

Photographs show what the foot-candle readings substantiated. At the left, the window lighted by foreign lamps for which super results were claimed and, at right, the window lighted by Mazda lamps of guaranteed characteristics

Mazda 200-watt lamps, a total of six to the window. The apparent difference in illumination was so great as to be startling. The photograph accompanying this article itself shows this graphically. Moreover, in the foreign-lamp-lighted window the illumination failed to get into the folds of the background.

Quantitative measurements of illumination were made at points as follows: A, a point in each window 18 in. from the front glass, on the window floor at the center of the window; B, a point 4 ft. back from the glass, on the floor at the center of the window; C, a point 2 ft. high on the back drape; and D, a point 3 ft. from the ceiling on the back drape, center. The following foot-candle readings were taken:

Position or location	6 G. E. Mazda lamps, 200-watt, in X-Ray reflectors	6 Duratest lamps, rated 200 watts each; old reflectors
A	100 ft.-candles	50 ft.-candles
B	110 ft.-candles	35 ft.-candles
C	100 ft.-candles	25 ft.-candles
D	85 ft.-candles	40 ft.-candles

These readings indicate that the Mazda lamps gave from twice to four times as much illumination.

Conclusions can be drawn only that if the foreign lamps were to be given away, (as a matter of fact, the price carried is $2.40 against 80 c. list for Mazda lamps) a merchant could not afford to use them. Life of the lamps becomes a menace under the conditions and the longer the lamp lasts the more it costs the user for the extravagance.

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Make the Bridge Fad Useful

ANOTHER instance of putting the law of averages to work is that of the Household Appliance Store in Denver, dealer in Westinghouse appliances exclusively. W. M. Marshall, the manager, opened the store in November and wanted to build a patronage quickly. So, in January, he extended an invitation to three clubs to stage bridge parties at his store, free of charge. He suggested that these organizations sell tickets for the parties and carry on charity programs with the proceeds.

The invitation was accepted and several successful affairs were held. Then the news spread like wild-fire and in a few days scores of clubs petitioned Mr. Marshall to grant them the same privilege. In three months at least 5,000 people, most of them women club members, had visited and played cards in the electrical store. Parties were staged five and six times a week, for both wealthy and poor organizations, with an average attendance of about 50 players.

Each party cost the store about $12, for a bridge instructor was paid to deliver a 30-minute talk on one of the current systems and a light lunch of refrigerated food was served when the playing had finished. The parties lasted about three hours and were usually held in the afternoon, although a few took place in the evening. The only requirement for the participants was the furnishing of tables and cards.

Prizes, too, of toasters and irons were furnished by the store. A $10 credit certificate on the purchase of a refrigerator or washing machine was awarded the leading scorer at each table.

No attempt was made even remotely to interest the visitors in the store's articles. A display was fixed on a small stage in the back of the room, with a refrigerator, ice-cooler, electric stove, radio and clock, but nothing was said about them.

However, ten direct refrigerator sales resulted from the parties, the store had become well known in three months and countless friends have been made who will bring the store future business.

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RECENT CIRCULARS of the College of Agriculture, University of California, include several pamphlets of interest to the electrical industry. Progress Report No. 18, of The California Committee on the Relation of Electricity to Agriculture, gives preliminary information relative to the walk-in type of farm refrigeration box. Progress Report No. 16, entitled "Some Field Observations on Coddling Moth Behavior", by Arthur D. Borden, relates some data relative to lighting tests in respect to coddling moth activities. Progress Report No. 17, "The Effect on Gladioli of Heating the Soil with Electricity", gives valuable preliminary data on soil heating. Bulletin No. 531, entitled "Walnut Dehydraters: Characteristics, Heat Sources, and Relative Costs", gives comparative costs and other figures and studies on walnut dehydration. Circular No. 325, "Construction and Operation of Electric Brooders", supersedes Bulletin No. 441, "The Electric Brooder", and brings much electric brooder information up to date.

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First G. E. All-Electric Kitchen in the West in San Francisco

From a Saturday Evening Post advertisement, Lloyd Kinkaid, former electrical contractor-dealer, sold the builder, Myer Brothers, of San Francisco, on an all-electric kitchen, offering this feature as a new drawing card to attract the fewer and choosier home buyers of today. The home, on display at Miraloma Park tract, San Francisco, was named, "The Edison". Ironically enough, the builder was sold on the electric kitchen although the home otherwise does not meet Red Seal wiring standards

Spokane School Teaches All Industry a Lesson

It Took Two Years of Planning and Building to Complete This $500,000 Spokane School, but the Electrical Industry, by Cooperating, Wrote the Word "Adequacy" All Over the Job

By LADNER V. ROSS
Illumination Engineer, The Washington Water Power Co., Spokane

JOHN R. ROGERS High School, the newest unit in the Spokane, Wash., 53-building educational plant, represents the first outstanding example of cooperation between all members of the Spokane electrical fraternity in promoting features for convenience, utility and economy. Manufacturers, wholesalers and contractors boosted for adequacy even while they pushed their own products.

"Building under stringent financial limitations" is not a new phrase to those who contact school architects and school boards. What is new, though, is to have the entire electrical family pull together and boost for adequacy and completeness in the electrical facilities.

Probably the outstanding achievement was the recognition of modern standards of adequacy and quality in artificial illumination. Too often it has been the tendency to treat this phase of the school merely as a necessary evil to provide for the janitor's needs, an occasional open-house or other evening functions and the once-in-awhile dark day.

The very fact that artificial lighting in class rooms is used to bolster up fading or clouded daylight should dictate unusual quantities of controllable light, inasmuch as even clouded days generally provide near the windows more than ten times the usual intensities of electric light. Furthermore, the increasing use of schools for longer periods of the day and evening in order to reduce the idle periods of costly educational plants indicates that any indifferent attitude toward this subject would be the height of indiscretion.

For the first time in Spokane, a system of luminaire rating was used by the school board to determine the relative technical merits of the various lighting fixtures offered in bids. This rating included such features as glare, light distribution, quantity of light output, shadows on working plane, maintenance, dust and dirt depreciation, appearance of the lighted unit and room, and luminaire cost.

While probably no method of fixture rating is perfect or would satisfy all manufacturers, it is true that this experiment accomplished one big purpose—it impressed every member of the board with the fact that there was something to consider in buying lighting fixtures besides eye appeal and price appeal.

Rooms of the classroom type required a little over 200 lighting units. Totally indirect luminaires using 300-watt lamps were provided for one-fourth of this number and would have been used throughout, except for cost, as all indirect units rated higher than other types of equipment. Semi-indirect units with dense glass bottoms, lightly etched tops, and the same wattage capacity were used in the remainder of the rooms. Installed lamp sizes provide better than 2 watts per sq. ft., and initial intensities range from 15 to 20 foot candles. This installation marks the first step upwards from the 150-watt lamps in small enclosing globes which have been the traditional light source in Spokane schools for the last fifteen years, although hardly a new school has been built in surrounding towns within the last five years which does not have a partial or complete installation of semi-indirect or totally indirect lighting.

The auditorium, seating 1,025, is lighted entirely from built-in lens units recessed in beams of the main ceiling and under the balcony. The units are modernistically arranged near the side walls to conform with the architectural treatment of this room. The lamps are placed off-center; this effectively directs the light toward the middle of the room, while diffused light amply illuminates the sidewalls, thereby avoiding the depressing effect sometimes found in rooms where no light is directed toward the ceiling.

Footlights and three borders, all wired for 100 watt lamps in three colors, provide for the conventional stage lighting, while stage convenience outlets make possible the use of special equipment. These convenience outlets are placed in walls, and not in the floor, where they would collect dust and dirt. Three outlets are available at each of four locations and each of the three are on separate circuits. Dimmer plates may be

Auditorium of the school, with built-in units plainly visible. Relamping and cleaning is done from cat-walk in the attic space

cut in to operate these three outlet circuits, provided the connected load corresponds with the dimmer capacity. A total of 24 dimmers are provided on the switchboard and interlocking of handles makes possible all the modern stage lighting effects, except pre-set.

Individual heating and ventilating units in every class room mark real progress in economical and effec-

tive control of room temperature and ventilation. These automatic devices heat the room air before pupils arrive and then draw in fresh air from outdoors as fast as room size requires and temperature control will permit. The amount of steam automatically is adjusted so that always there is just enough fresh air without wasted heat. Used air is vented into hallways where it ascends through stair wells and finally escapes from roof ventilators.

A complete conduit system has been provided for the installation of a radio re-broadcasting system. It is intended that this equipment will provide for the reception by any or all classrooms of messages or programs

Special units are used in the gymnasium and a heating and ventilating system is installed. Enclosed units light dressing rooms, washrooms, hallways and kitchens

originating on the auditorium stage, the principal's office or the outside air. Consideration of technical features has slightly delayed the completion of this feature.

An up-to-the-minute program system operating all clocks, bells and gongs throughout the school marks another important forward stride in modern school equipment. Seven circuits of gongs and bells are operated from two different program cylinders, one for convocation days and one for regular school days. All bell circuits may be operated at will at any time without disturbing the program, and changes in the program may be made by merely changing the locations of small metal pins.

Fifty-four semi-flush clocks, one in every room in the building, are wired on four circuits, each with a small master clock in the office. The entire program and clock system has an automatic master re-setting device which measures the length of any current interruptions which might occur, and then, as soon as service is restored, operates the entire system at double frequency, or double time, until the deficiency has been made up, after which the device automatically cuts out and restores the 60-cycle service. Current interruptions less than fifteen seconds in duration will not operate the re-setting machinery, but are not lost however, as all interruptions, no matter how brief, are added up; as soon as they total more than fifteen seconds, the re-setting equipment starts up.

Operating on the same energy supply as the program bells is a complete automatic and manual fire alarm system with separate circuits and separate gongs.

Heavy duty electric equipment is used throughout the cafeteria kitchen—range, oven, mixer, slicer, potato peeler, wishwasher and refrigerator. The domestic science room has electric ranges of regular residence type provided for every four pupils, and a large refrigerator for keeping supplies.

Individual motor drives characterize all the lathes, drill presses, saws and other machines installed in the woodworking and machine shops. An abundance of convenience outlets provide for all portable appliances, machines and lamp cords.

Practically all of this electrical equipment was sold after the wiring contract was let and the building was well on the way to completion. We leave to your own conjecture just how much of this could have been sold had every lighting fixture and every electrical appliance proposed required additional wiring—extra circuits in the panels, heavier feeders, larger switches on the main distribution panel, as well as entirely new panels and feeders in some places. It is obvious, therefore, that in order to sell readily all of the electrical equipment that should go into a new building upon completion, it is first necessary to visualize the uses to which every room in the structure will be placed and then to paint a word picture of the probable electrical requirements to the architect or building committee.

That the importance of preparing for equipment sales by helpful planning with the customer for electrical convenience and adequacy is not generally realized by power company officials is demonstrated by the fact that so few companies on the Pacific Coast are actively assisting architects and builders to prepare electrical plans and specifications.

Of course, selling wiring, like almost anything else, can be overdone. Wiring shouldn't be sold on the basis of so much capacity for a given unit of area, unless it is impossible to anticipate the practical uses to which a building will be put.

It is necessary to point out the kind of lighting that should be used in certain spaces, and the probable appliances or permanent equipment that will be logical in other places, either immediately or ultimately; then the wiring required to serve such lighting, appliances, and equipment will not seem unreasonable or unnecessary.

The sequences of this particular job were, first, the layout for the architect, on his preliminary plans, of the capacity and location of all lighting outlets, convenience outlets, switches, clocks, phones, radio, panels, special appliance outlets, and so on as best we could anticipate or learn the usages of different spaces. As the plans progressed, changes and additional features were suggested. Equipment was discussed at every contact, serving to crystallize the uncertain details of wiring. Finally, we assisted in preparing tables of circuits and feeders, and various paragraphs of the electrical specifications. Just before the plans were released for bids, we were asked to go over the entire plans and

No direct lighting is used in the school; all units are semi- or totally indirect with 300-watt lamps

specifications to check for errors or omissions and to make any final suggestions.

Some of the principal features of the specifications included:

No wire size less than No. 12 B. & S. gage except for low voltage circuits;

Initial load per circuit limited to 1,000 watts, as indicated by figures on plans;

Limit of 6 duplex convenience outlets per circuit and none to be connected to lighting circuits;

Local switches especially designed to operate type "C" Mazda lamps and of not less than 20 amp. capacity.

Electrical service is rendered at 2,400 volts, three-phase, four wire, and a transformer vault provided in an outer wall back of the heating plant. Secondary service consists of seven 500,000 circ. mil. cables in a 6-in. conduit, two for each phase and one for the neutral.

In addition to symmetrically-placed lighting panels on each floor, special panels are located at all other load centers, such as domestic science room, machine shop, woodworking shop and cafeteria kitchen, to take care of the special electrical equipment only.

All lighting equipment, all clock and program equipment and all wiring material was furnished and installed by Maxwell & Franks, electrical contractors, with the exception of the special lanterns and brackets and the RLM dome reflectors. The special bronze exterior lanterns and vestibule and auditorium brackets were designed and built by the Inland Electric Co., who also furnished the RLM dome reflectors used in the shops.

The completed John R. Rogers high school stands as an example of the loyalty and farsightedness of every electrical man in Spokane, and, as a result, is pointed to with pride as a model of up-to-date efficiency and completeness by all citizens who have seen it.

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Night Golf Grows Up

Not a Miniature Course, But a Regulation Nine Holes Is Lighted in San Francisco, and the Apparent Success of the Installation Presages More $25,000 Jobs

By ELLIOTT CONREY
Illuminating Specialist, Pacific Gas and Electric Co.

NIGHT GOLF is on trial in San Francisco. Not a miniature or pitch-putt golf, but the real game on a full-sized course with regulation floodlights to furnish illumination. And it looks as if the verdict will be: "Guilty—of success."

It took two years to complete the arrangements for the lighting of the Ingleside golf course, a privately-owned, public club on the outskirts of San Francisco, but the first nine holes were opened to night golfers on June 11. This nine is 3,334 yards long, covers approximately 55 acres and has a rated par of 37. It is the first championship course in the West to install lighting equipment for night play.

One of the floodlighting poles behind the No. 5 tee. No pole is on the course proper; each is so removed as to offer no obstruction or additional hazard to players. Each unit is adjustable for focusing and pothead disconnects and fuses are mounted on the poles

Near the clubhouse, No. 9 green. As may be seen, few places on the nearby fairway are very dark, even under the trees. Balls are not easily lost on this course at night

Pacific Gas and Electric Co. lighting engineers sold the job and drew up the plans and then, with the help of Don Gray, Westinghouse Electric & Mfg. Co. representative who sold the equipment, supervised the installation. But the enthusiasm of Thomas Hutton, general manager of Ingleside Golf Co., Inc., owners of the course, certainly spurred everyone on, confident that the plan would succeed.

Only 134 1,500-watt and 5 1,000-watt floodlights are used to light the fairways, greens and great portions of the rough. Because this was only half as many as were used on Eastern installations, critics contended that the installation would be insufficient, but results prove otherwise.

Twenty-three 70-ft. poles support these floodlights,

Looking down No. 6 fairway from the tee in daytime. This 165-yd. hole seems longer, often causing players to overdrive

Here is the same fairway at night, with artificial illumination. The flag is plainly visible and doesn't seem so far away as in the day, so that players usually calculate correctly and do not overdrive. Of course, a bad slice into the trees at the right might result in a lost ball, but that's a day hazard too

each strategically located and one each, in all cases, near the tee and green. Double crossarms with platforms are provided and a Westinghouse transformer is located on each pole. Because the number of lights per pole varies from two to eleven, the 23 transformers are of various capacities.

The larger floodlights were type CAG 20, a unit of very high candlepower intensity and general efficiency. The smaller units were CAG 16's and were used for touching up spots under trees and in the rough adjoining the fairways. Ingleside is the first course to use closed type projectors (glass reflector and lens) in a complete installation.

All of the electrical construction work was done by the Langlais Electrical Co., of San Francisco. The wiring is all underground, in trenches 18 in. deep. Potheads at junctions are of 7,500-volt capacity. Nearly 10,000 ft. of cable was used, including 5,800 ft. of 2-conductor, No. 8, 2,400-volt Trenchlay; 2,800 ft. of 4-conductor, No. 8, 4,100-volt Trenchlay; and 1,000 ft. of 2-conductor, No. 8, rubber and lead cable.

It took real courage to spend $25,000 for this pioneer installation, but better golf for the players and better patronage for the club have followed. On an average,

No. 6 green. Notice the whiteness of the balls and the sharp contrast of the playing area and the surrounding trees

about 100 golfers have played each night under the lights, and San Francisco nights are best in August and September. Perhaps, during the better months, the average will increase considerably.

At 2 c. a kilowatt-hour, with 210 kw. installed, the hourly electricity bill is about $4.20. Figuring interest on investment, depreciation, upkeep, and similar factors, the installation is really paying for itself.

Exhibition matches are held about twice a week and the reactions of the visiting professionals watched. They claim that the artificial light, for some unaccountable reason, aids players in keeping their heads down and eyes upon the ball. The fact that the greens stand out under the light also aids players in approaching. The distance is easily reckoned and there is less danger of pressing or of approaching short. Thus scores may easily be bettered at night.

Then, too, golfers who dislike to wait in the crowded ranks on Saturday and Sunday and who are unable to arrange golfing time during the working week find night golf the right outlet. The weather is cool and invigorating, if a little damp, and time is of little essence at night.

On the other hand, a factor tending to retard the success of this installation is the fog, which usually comes in about sundown, wetting the course and hindering accurate putting on the greens. Of course, every night is not foggy, and the success of the course so far indicates that this obstacle is not dampening the spirits of the San Francisco golfers.

Judge for yourself from the pictures whether the night lighting is as good as that of the sun. After all, the only test is the effect upon those who play the game.

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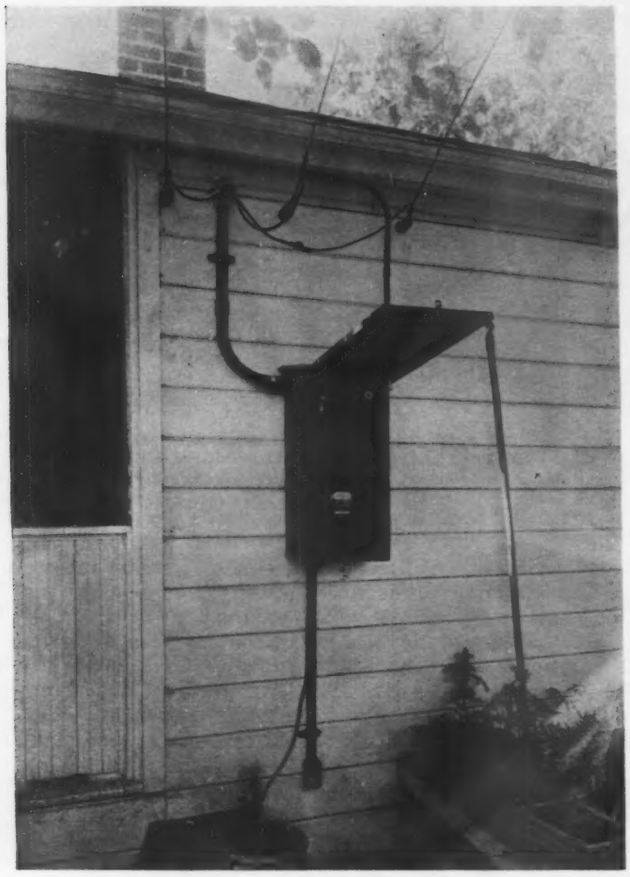
Stockton Experiments With Portable Range Wiring

A COMBINATION steel meter cabinet and fuse box, detachable in case removal is desired, is a neat wrinkle in range wiring which is being tried out on the lines of the Pacific Gas and Electric Co. in Stockton, Calif. The cabinet was designed by J. M. Zarwell, former electrical contractor and later a switch panel manufacturer in Oakland, Calif. Mr. Zarwell now is engaged as an estimator for Collins Electric Co., in Stockton.

The cabinet and assembly, as illustrated, consists of a run of 1½-in. conduit, with a weather-head attached, bonded to a steel cabinet. In the cabinet are, first, a 100-amp. toggle main switch, below which a fuse block for lighting circuits is tapped off. Second, is a tap with a 30-amp. fuse block from which are two No. 8 leads



Cabinet and assembly used in Stockton

for a water heater. In another section is located a 60-amp. fuse pull-out for a range. Three No. 6 wires are brought to this for the range. All switches and fuse compartments are segregated and provided with a dead-front panel. With two lighting circuits, sufficient room is left in the box for four 60-amp. pull-outs, in case electric heating is desired.

The width of the box is such that it can be recessed between the studding if so desired. It has received the approval of the Fire Underwriters and the local inspection authorities in Stockton. In the installation pictured, a special ruling was granted because of the low roof of the house. Ordinarily, the conduit run is sufficiently long to comply with Railroad Commission requirements.

This assembly offers a removable range wiring installation which, if the tenant moves, can be removed by an electrician and reassembled at the new location for very little expense.

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An Upside Down Building

GREEN tiled, with a monster electric clock, neon lighted, the recently completed Eastern Outfitting Bldg. in Los Angeles, is unique not only in its colorings. It is unique also in the fact that the mechanical equipment for such a building, usually found in the basement, is up on the roof in a pent-house tower.

The reason is natural enough. A large department store such as this finds the basement one of its most important merchandising areas. The space there is far too valuable to be turned over to mere mechanical and electrical equipment. Let the roof be used instead. And after all, has not the roof supported the elevator equipment for many years now?

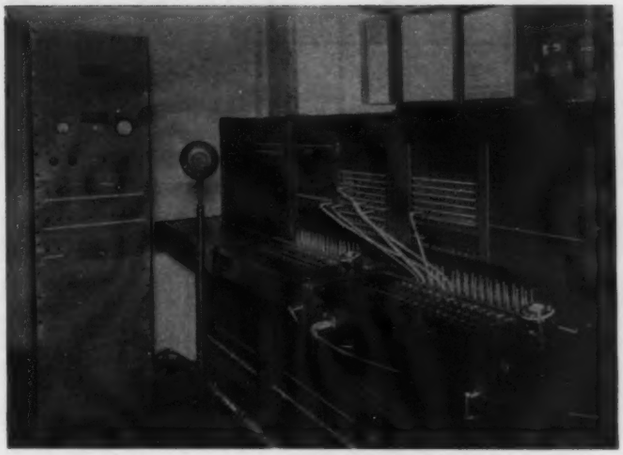
From an electrical standpoint this decision on the part of the owners, architects and the engineers required special handling of supply by the Los Angeles Bureau of Power and Light. The transformer substation is located on the 14th floor or roof pent-house. Adjacent to it is the main switchboard. Two sources of supply are brought into the building directly from the 4,600-volt underground system in the street. Two ducts are carried from the street vault into the basement and thence vertically upward through a concrete column to the transformer vault on the roof. In each duct one 3-conductor, rubber-insulated, lead-sheathed, steel-armored, 5,000-volt copper cable is suspended by an armor clamping device in the transformer room.

These cables terminate at the 4,600-volt automatic transfer switch designed and constructed by the Bureau of Power and Light. The automatic equipment assures a continuous source of energy by automatically throwing the load over to the emergency cable if the preferred cable is in trouble.

A connected load of approximately 400 hp. in 220-volt, 3-phase motor load, and 8,000 amp. of 110-volt, single-phase lighting is served in this manner. The lighting load is balanced approximately on the 3-phase system. It is supplied by a bank of three 150-kva. transformers, while the power load is supplied by a bank of three 75-kva. transformers. Each bank is individually controlled by an automatic oil circuit breaker.

The electrical installation in the building, including the built-in types of modernistic lighting and all general facilities, was installed by the Newbery Electric Corp., Los Angeles. A microphone-operated paging system, employing small speakers strategically placed throughout the building, operated either from the telephone switch-

Eastern Outfitting Building



Instead of using bells to call salesmen and officials, a public address system has been installed with amplifiers on each floor. The microphone is at the telephone operator's board, as shown, with the regulating panel close by. This system also can be used to call patrons to the phone, if necessary

board or the reception desk in the entrance on the main floor, was designed and installed by Lombard Smith, telephone engineer, Los Angeles.

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What to Tell The Architect

By C. A. ROWLEY
Rowley Electric Co., Pasadena, Calif.

SINCE the beginning of your course of study you have been taught with more or less regularity that in any building project "the owner interest is paramount," and that, as the owner's representative, you are charged with the responsibility of protecting his interests at all times. In preparing plans and specifications you must give due consideration to structural strength, utility, convenience, comfort, and a thousand and one other features. And yet, throughout, you must never forget that you are spending another's money and that you will be expected to deliver a maximum of value for each dollar entrusted to you.

Lighting and heating and the various other applications of electricity to the modern home and commercial life may be conceived and designed by specializing engineers. But it remains for the electrical contractor to execute properly the carefully laid plans of the specialists if anticipated results are to be realized.

If a job is to progress smoothly and efficiently, and without waste of time and materials, there must be a maximum of cooperation between the architect and the various contractors. Therefore, in selecting sub-contractors, including the electrical contractor, the architect should be careful to consider only such men as are known to work harmoniously with other craftsmen.

This thought brings us directly to the much-discussed subject of segregated bids. Shall the architect let the sub-contracts separate from the general contract or shall he include them therein?

A canvass of sub-contractors no doubt would show a majority of them in favor of segregated bids; and a canvass of general contractors would most likely show a majority opinion against segregated bids.

You will find yourself obliged to decide this point frequently. Neither method, in my opinion, is 100 per cent right, but generally speaking I believe that if the architect retains full right to select sub-contractors he will be more likely to get men who are cooperators and, with these men on the job, can better protect the interests of his client.

Segregated bids, to me, seem particularly desirable when the work involved is of a technical nature requiring the direct supervision of the architect or his engineer.

The majority of plans prepared by architects show very complete layouts for plumbing and heating; and the plans are backed up by specifications that tell in complete detail the exact equipment on which proposals are asked.

These same plans rarely ever give any pertinent facts relative to the electrical equipment beyond locating the outlets. And the specifications leave the problem of calculating feeder sizes, switch and panelboard types and capacities entirely up to each competing contractor.

Under the stress of competition the electrical contractor is forced to keep his calculations just within the legal requirements, which all too often do not guarantee proper service to the owner. This results in an installation just sufficient for immediate needs with no margin for possible future enlargements.

Therefore, the architect, as part of his responsibility to the owner, should prepare plans and specifications which tell exactly what he wants installed,—feeder wire and conduit sizes, switch and panelboard types and capacities, etc. He should locate each piece of equipment exactly where he wants it and should know in advance that it is structurally possible to install it there.

State plainly whether electric services are to be underground or overhead, and whether the supply will be taken from aerial or underground mains. Give exact distances from a certain point of the structure to the nearest pole or underground service, or call for a proposal or a definite length of a given size and type of conduit and cable.

Determination of this exact information in advance of taking bids requires specialized engineering knowledge. If the architect does not have this talent in his own organization he owes it to his client to obtain the services of a competent engineer.

In taking proposals on a job where price is of prime importance, select men to figure the work who work on a quantity rather than a quality basis.

When quality and service to the owner are of first importance, take proposals only from men known to work on that basis. Never ask men of the latter type to bid against men in the former group. You will be wasting their time without chance of repaying them. *Don't take too many bids.*

After you get set up in business try to select a contractor or two in each craft on whom you can depend. As long as they play fair with you give them your work. You will get better installations, and in the long run, the cost, all things considered, will be no higher than if promiscuous proposals are accepted. A tried and tested contractor takes much less of an architect's time than a new man whose policies are not known.

Editor's Note:—While these instructions were prepared for a class of student architects, the reasoning used is applicable to any architect. If contractors make use of these points they should be able to make a definite improvement in plans, specifications, and in their relations with the architects.

Meter Studies Can Pay Dividends

In Asking the Pertinent Question, "Do Your Meters Register Every Sale of Energy?", the Author Sets Forth Factors Affecting Meter Accuracy. In Answering It, He Shows That Appreciable Savings Can Be Made by Correcting Meter Registration

ALTERNATING current wattmeters, either single-phase or polyphase, may be classed as self-contained or primary, the latter requiring the use of instrument transformers. While the single-phase, self-contained meters outnumber other types, a greater portion of the energy sold is measured through primary meter installations.

Inasmuch as the utility relies upon its meters to insure that the consumers pay for value received, it is highly important both to the consumer and to the utility that meters register accurately. From the utility's viewpoint, meters which are accurate only to 1 per cent may be responsible for the loss of many dollars of revenue. Meters of acceptable accuracy when tested in the shop may be subject to many influences affecting their registration when installed on a consumer's premises. Testing on the premises often will not reveal discrepancies, because such influences may be periodic in character or may affect the standard meter similarly. On the basis of a 1 per cent variation in accuracy, a meter may fail to register 10,000 kw.-hr. out of every 1,000,000 kw.-hr. of energy sold. Capitalizing this loss at a cost of 1 c. per kw.hr. would make $100 available to correct the defect or to apply on the price differential demanded for the purchase of a more accurate meter.

Registration of watt-hour meters is affected by many factors, prominent among which are instrument transformer burdens, voltage, capacity for overloading, stray fields, temperature and power factor. The effect of each of these factors will be discussed in subsequent paragraphs.

Instrument Transformer Burdens

Current and potential transformers are designed to deliver the secondary current or voltage of correct ratios and phase angles only at specified secondary burdens. Too many instruments or too great a length of small secondary leads will cause low registration of the meter, but care in the selection of types of instrument transformers and of their connected secondary burdens largely will overcome this source of error.

No. 3 of a series on utility economics, in which the watt-hour meter is analyzed as a potential source of savings in operation

Standard current transformers are designed to give their best performance at approximately 65 per cent of rated primary current, which means that the size of the transformer should be 150 per cent of the ampere capacity of the load. A common mistake in the use of current transformers is that of having a capacity of 150 per cent of the total connected load instead of 150 per cent of the average load.

A typical case illustrates the effect of this mistake: Three-phase power was metered at 2,200 volts through 1,000/5-amp. current transformers and delivered to a customer whose maximum load was 690 amp., minimum load 35 amp., and average load 300 amp. To check registration, a modern polyphase meter was installed and connected to the potential transformer already in service, but furnished with current from a modern current transformer of 600/5-amp. capacity. A study of performance curves of similarly rated current transformers on such a load will indicate why the monthly registration of the 600-amp. equipment was 0.2 per cent to 2.0 per cent greater than the registration of the 1,000-amp. equipment. In less than a year the new metering equipment had paid for itself.

Voltage, Overload Capacities, and Stray Fields

Voltage increases decrease the registration of most meters, particularly of the older types. Both service and test meters should be calibrated at the operating voltages on the customers' premises. Meters also do not register load values over their entire current capacities

By J. P. SURRATT
Salt River Valley Water Users' Association

with equal accuracy. This is true particularly of self-contained, single-phase meters of the older types, whose accuracy drops very rapidly on loads over 125 per cent capacity. The accuracy of the modern single-phase meter drops less than 1 per cent on loads of 300 per cent capacity; in addition, the modern meter will register very light loads more accurately. Modern primary meters have been improved to the point where registration curves now are practically a straight line, with correspondingly greater accuracy at very small loads. As meters should be calibrated for the loads most used, this requires the use of a test meter having accurate load curves for all current ranges.

Conductors carrying large values of current set up stray fields that have a slowing effect on a meter. The average watt-hour meter is located at such distances

from primary conductors that it is not influenced by such fields. Meters within a stray field of constant value can be calibrated to compensate for that effect, provided the test meter is not influenced by this field.

In the test of a polyphase meter, checks were found to vary as much as 0.5 per cent. An investigation showed that conductors carrying a load of 400 to 800 amp. were located 3 ft. below the concrete floor upon which the test meter was placed. When the test meter was removed from the influence of this field, the checks were regular and consistent.

Shop tests made to check the effects of stray fields have shown that a conductor carrying 800 amp., when placed 3 ft. from a test meter, will set up a stray field sufficient to cause the test meter to run from 0.4 per cent to 1.5 per cent slow.

When the source of the testing current is a "phantom load," stray fields are set up which tend to lower the registration of the test meter. The value of this slowing effect depends upon the type of meter and the distance between the test meter and the "phantom load" and may be as great as 1.0 per cent. Test meters that are to be used with "phantom loads" or near conductors carrying heavy currents should be protected by soft iron shields.

In general, modern meters are less susceptible to the effects of stray fields than are the older types, but every precaution should be taken to protect or compensate a meter which is to be located in an external magnetic field.

Power Factor

Errors due to incorrectly "lagged" meters are of greater importance than is ordinarily realized. On a three-phase load with the relatively good power factor of .866, a two-element meter will have one element operating at unity power factor and the other at 0.5 power factor. Assuming the meter is calibrated to register 100 per cent and 98 per cent on loads of unity and 0.5 power factor, respectively, and a true value of total energy to be 1,500,000 kw.-hr., the element operating at 0.5 power factor should register 1/3 of total power, but actually will register 0.98(1/3 of 1,500,000 kw.-hr.) or 490,000 kw.-hr., which is 10,000 kw.-hr. short. Total registration is

$$\frac{1{,}490{,}000}{1{,}500{,}000} \times 100 = 99.33 \text{ per cent.}$$

On single-phase meters, the increasing use of motor-driven appliances, especially refrigerators, increases the need for accurate power factor adjustment.

Temperature

One of the greatest sources of error in the registration of meters and one of the most difficult to correct is that arising from changes in temperature. Until a few years ago practically no meters were compensated for this effect. A temperature rise increases registration on loads of unity power factor and decreases the registration on loads of low power factor lagging, the lower the power factor the greater being the change. For a temperature change of 60 deg. F. with loads of both unity and 0.5 power factor lagging, changes in registration range from 2 per cent to 8 per cent.

Many utilities make routine tests of their single-phase meters during the summer months. If the meters are uncompensated, each will register slow during the winter, when the greatest consumption of energy occurs. Uncompensated meters can be calibrated accurately at any given temperature, but the difficulty lies in selecting the best operating temperature for calibration. To a lesser extent this also applies to compensated meters.

To illustrate temperature effects, four uncompensated primary polyphase meters were mounted on same switchboard. All were calibrated at the same time by the same tester, with the room temperature approximately 105 deg. F. Six months later, with the room temperature at 40 deg. F., these meters were retested, with the following results:

Per Cent Changes in Registration, 5-Amp. Loads

	Power Factor Unity	Power Factor 0.5 Lag
Meter No. 1	−1.7	2.7
Meter No. 2	−1.0	4.7
Meter No. 3	−1.7	2.6
Meter No. 4	−1.9	6.1

The net change in registration of a compensated or an uncompensated meter due to a given temperature variation can be calculated approximately, provided the actual change of temperature inside the meter is known and a temperature curve for the meter under test is available.

Effect of Temperature on Meter Registration

Meter Number	Load Power Factor	Power Factor of Elements	Per Cent Registration of Three-Phase Power at 35 Deg. F.		at 75 Deg. F.	
			Per Cent Gain or Loss	Net Registration	Per Cent Gain or Loss	Net Registration
1	1	0.866 lead	.....	.....	+3.8	.....
		0.866 lag	.....	.....	+0.7	102.3
	0.866 lag	1	.....	.....	+2.4	.....
		0.5 lag	.....	.....	−1.5	101.1
	0.707 lag	0.966 lag	.....	.....	+2.0	.....
		0.259 lag	.....	.....	−8.9	99.7
	0.5 lag	0.866 lag	.....	.....	+0.7	.....
		0	.....	.....	.....	100.7
2	1	0.866 lead	−1.8	.....	+2.4	.....
		0.866 lag	+0.3	99.3	−1.8	100.3
	0.866 lag	1	−0.8	.....	+0.9	.....
		0.5 lag	+3.0	100.5	−7.6	98.1
	0.707 lag	0.966 lag	−0.6	.....	+0.2	.....
		0.259 lag	+8.7	101.4	−3.2	97.4
	0.5 lag	0.866 lag	+0.3	.....	−1.8	.....
		0	.....	100.3	.....	98.2
3	1	0.866 lead	0	.....	+0.1	.....
		0.866 lag	+0.3	100.2	−1.0	99.6
	0.866 lag	1	+0.1	.....	−0.2	.....
		0.5 lag	+0.7	100.3	−2.6	99.0
	0.707 lag	0.966 lag	+0.2	.....	−0.4	.....
		0.259 lag	+1.3	100.4	−3.7	98.9
	0.5 lag	0.866 lag	+0.3	.....	−1.0	.....
		0	.....	100.3	.....	99.0
4	1	0.866 lead	−0.2	.....	+0.7	.....
		0.866 lag	+0.1	100.0	−0.2	100.3
	0.866 lag	1	−0.3	.....	+0.3	.....
		0.5 lag	+0.2	99.9	−2.7	99.8
	0.707 lag	0.966 lag	−0.2	.....	+0.2	.....
		0.259 lag	+0.6	100.0	−2.7	99.8
	0.5 lag	0.866 lag	+0.1	.....	−0.2	.....
		0	.....	100.1	.....	99.8

Test curves and data sheets from which the accompanying table was compiled show large changes in registration due to temperature effects in uncompensated meters (Nos. 1 and 2) and marked improvement in temperature performances of those that were compensated (Nos. 3 and 4). The registration of modern meters, either single- or polyphase, is of high accuracy, provided the meters have been calibrated properly.

In general, changes in registration due to temperature changes are very slight for loads of unity power factor, but for loads of low power factor the error increased and is not uniform. Above 90 deg. F. the rate of change in registration also increases rapidly.

Service meters cannot be calibrated to an accuracy exceeding that of the test meter used for calibration. Time is wasted in attempting to calibrate a meter closer than plus or minus 1 per cent, when using an uncompensated test meter, unless the actual temperature and

performance of the test meter is known. If the test meter and service meter have the same characteristics and temperature at the start of the test, registration of each will change the same extent and the tester will be none the wiser.

Since a rotating test meter is only a single-phase meter mounted in a carrying case, it is subject to all the errors of service meters. Modern test meters give good performances on varying voltages, load, power factor and temperature. However, each test meter should be completely shielded from external fields, equipped with a thermometer and provided with curves giving corrections for all values of voltage, load, power factor and temperature found in practice. Such a meter, when properly used by competent testers, constitutes the best investment any utility can make.

Obsolescence

From the foregoing discussion of inaccuracy in meters, it will be noted that many inherent defects are present in meters of the older types. On every system there are large numbers of meters over 10 years old and, if their effect in reduced revenue could be totaled or even estimated, executives would find that an appreciable sum could be justified to correct the loss. While the accounting department of the average utility uses the most modern equipment available to increase the accuracy of billing, often the raw material for that department, the meter registration, is inaccurate to an extent nullifying its use.

Meters become obsolete for reasons similar to those applying to steam turbines; that is, increased efficiency and greater output. The efficiency of modern meters has been increased by reducing the losses of current and potential coils to 1.2 to 1.5 watts as compared with 2 to 3 watts losses for obsolete meters. A saving from this alone of 1 watt at a power factor of 0.2 totals 5 kva. per 1,000 meters, equivalent to 43,800 kva.-hr. or 8,760 kw.-hr. per year.

The modern meter has the ability to register practically all of the energy that passes through it and, having lighter moving elements and better bearings, the sustained registration is longer, thus extending the time required between routine tests.

Current transformers now are available with performances at values from 5 per cent to 125 per cent of rated capacity superior to the performances of current transformers of 10 years ago at 10 per cent to 100 per cent capacity.

Numerous cases are on record where modern primary metering equipments were connected in series with old metering installations and have paid for themselves within a year by increased but correct registration.

A gain in registration also is secured by the use of modern single-phase meters which, in the 5-amp., 115-volt size, cost approximately $8.50 and will register loads from 2 to 1,500 watts.

Assume a residential customer having those load values is metered through an obsolete meter. This meter will not register a load of 2 watts (an electric clock) when no other load is on (which is approximately eight hours per day). Loss = 2 x 8 x 365 = 5.84 kw.-hr. each year.

An electric toaster and percolator used at breakfast with 200 watts of lamps will produce a load of 1.2 kw. At this load the old meter will be approximately 2.5 per cent slow. Loss = 0.025 x .25 x 1.2 x 365 = 2.738 kw.-hr. per year.

On an average of once a week an electric iron will be used two hours after a lighting load of 600 watts is on. Loss = 0.025 x 2 x 1,200 x 52 = 3.12 kw.-hr. annually.

For an average of four hours per week, a lighting load of 1,000 watts or over will be used, producing a yearly loss of 0.02 x 4 x 1,200 x 52 = 4.992 kw.-hr.

Being uncompensated, the meter will register 1 to 3 per cent slow when operating at low temperatures. If consumption averages 50 kw.-hr. per month for the five coldest months, loss will be .02 x 40 x 5 = 5 kw.-hr. Total yearly loss = 21.69 kw.-hr. Capitalizing this loss at 5 c. per kw.-hr. gives $1.08, approximately 15 per cent of the cost of a new meter.

Losses in proportion are caused by the use of obsolete meters of other capacities. The larger the capacity of the meter the more quickly will the changing to a modern meter pay for itself.

Modern meters and metering equipment, when properly calibrated, will register practically 100 per cent of the energy delivered to the consumers. Their use will result in registrations that are fair to the customer and will pay dividends to the utility.

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Diesel vs. Motor Costs On Rural Schedules

Diesel Installations Often Appear Cheaper Than Electric Service Unless All Factors Are Considered. Going Prices and Conservative Interest Rates Are Used to Make This Comparative Cost Analysis Fair

DEPRESSION prices for farm produce, increased sales activity and optimistic cost figures have produced a discernible tendency among large users of agricultural power toward consideration of diesel power. From the first commercial application of a diesel engine in 1897, manufacturers steadily have improved their products by reducing weight per horsepower, improving reliability and increasing efficiency so that, today, the modern diesel engine represents a great advance over its predecessors. However, present-day efficiencies are near the maximum expected from this type of prime mover and the rate of improvement can not be expected to continue in the future.

The farmer, faced with decreasing income, is forced to investigate the most economical methods of supplying power for irrigation and other farm uses. Much favorable publicity has been spread regarding the large saving which may be made by using diesel engines and the result, in some instances, has reacted unfavorably against electric power. Although diesel engines are highly satisfactory for certain purposes where expert operators can give them proper attenton, operating costs may be excessive if the engines are run with the small amount of attention, and that inexperienced, to be expected in rural service. For this reason the following comparison of diesel and electric motor costs has been prepared. Current prices of equipment, labor and fuel oil have been used, and the agricultural

schedule of a large California power company is the basis for comparison.

In order to arrive at the total annual power costs, it will be necessary to consider all the factors which make up those costs. These figures include all fixed and operating charges. Component parts of these are itemized below and a brief discussion of each follows the itemization.

Fixed Charges:

1. Interest on capital investment
2. Depreciation and obsolescence
3. Taxes
4. Insurance

Interest is calculated to be between 6 and 7 per cent. Depreciation depends upon the useful life of the equipment and a certain sum should be set aside annually to replace worn-out equipment. Obsolescence is important as equipment frequently is replaced with more efficient and modern apparatus before it is worn out. For this comparison, depreciaton is considered as below:

Diesel engine—10 years life—10 per cent

Electric motor—15 years life—6.66 per cent

Taxes include city, county and state levies which generally are based upon 40 to 50 per cent of investment and run from four to six years. In this study they are assumed to be 1.5 per cent annually. Insurance is taken as 1 per cent annually.

From the foregoing a general figure for fixed charges was compiled. Fixed charges on a diesel installation are calculated to be 18.5 per cent and on the motor installation, 15.16 per cent.

Operating charges:

1. Fuel oil or power costs
2. Lubricating
3. Maintenance including repair and installation labor
4. Attendance costs

Operating costs are dependent upon the actual hours of operation. Power costs are based upon a utility agricultural schedule which varies according to the energy used. Motor efficiencies are taken to be 90 per cent on a kilowatt basis. Diesel efficiencies are based on the brake-horsepower output and belt losses are assumed to be 5 per cent.

From a recent investigation of fuel oil costs and freight rates, it was found that oil delivered in farmers' tanks on ranches in the central California farming areas would cost between 4 and 6 c. per gallon. A new diesel engine probably will average 14 hp.-hr. per gallon of fuel oil for the agricultural season.

Lubricating oil can be laid down on the ranch in 50-gal. drums for 50 c. per gallon. It is estimated that the average diesel installation will develop 2,000 hp.-hr. per gallon of lubricating oil.

Maintenance includes new parts, labor to install them, adjustment of valves, valve grinding, engine attendance, fuel handling, grease and supplies. Present available data show an average of about ¾ mill per hp.-hr., based upon a 10-year engine life. Various engine manufacturers are quoting $2 per horsepower-year, which would cover an average agricultural installation operating 2,000 hours per year. When annual load factors are high, this figure should be increased.

With diesel engine drive, it will also be necessary to consider the maintenance of belting. Information secured from the better belting sales people shows that belting costs vary from $1.00 to $1.75 per horsepower transmitted at average loads.

These prices are for seamless belting of medium quality and data are based upon a 3,000 f.p.m. belt speed. Belting of this quality should last three or four agricultural seasons.

Motor maintenance includes an annual oil change, greasing and an electrical inspection. This should not exceed $10 per year.

Attendant labor is omitted in this discussion, but there will be a great deal more time associated with the starting and stopping of the diesel engine than with the starting of an electric motor.

Regarding the cost of installation, various sales organizations recently have found that it is necessary to curb recommendations on the total equipment of a good diesel engine installation, and sometimes are willing even to install the engine without a clutch or outboard bearing. The following tables gives costs on various items needed for an agricultural installation where a quarter-turn belt is used to drive a deep-well pump.

Estimated Diesel Engine Costs

Horsepower	30	45	60	80	120
No. of Cylinders	2	3	4	4	6
Engine	$1,500	$2,140	$2,700	$3,200	$4,800
Air starter	236	236	236	236	236
Cooling pump	50	50	50	50	50
Shaft, bearing and pulley	100	100	100	150	200
Fuel tanks	50	50	60	60	60
Mufflers	25	25	25	25	25
Foundations bolts	10	10	10	10	10
Engine foundation	25	30	40	50	60
Building	40	45	50	60	70
Trucking, freight	25	30	40	50	60
Labor to install	60	60	80	90	100
Belting	30	45	75	130	200
Estimated Costs	$2,151	$2,821	$3,466	$4,111	$5,871

Concrete at $10 per cu. yd., corrugated iron at 5c. per sq. ft., lumber at $25 per 1,000 bd. ft.

For the installation of a clutch on outboard pulley shaft, add approximately $100.

The above prices are on the basis of December quotations and are subject to price changes.

A similar cost table is given below for an electric motor installation at 1,200 and 1,800 r.p.m.

Electric Motor Installation Costs

Items	Horsepower of Motors 25	40	50	60	75	100	125
Magnetic starter	$ 35	$ 35	$ 35	$ 91	$ 91	$ 91	$ 160
Motor	$320	$417	$474	$619	$733	$903	$1,061
Speed r.p.m.	1,800	1,800	1,800	1,200	1,200	1,200	1,200
Volts	220	440	440	440	440	440	440
Wiring	$40	$50	$60	$70	$80	$100	$120
Foundation	(Pump serves as foundation)						
Building	20	20	25	25	30	30	40
Freight	10	10	15	15	15	20	20
Labor to install	(With pump and wiring)						
Total Cost	$425	$532	$609	$820	$949	$1,144	$1,401

Note: All starters are cross line starters. Motor prices are for vertical hollow shaft motors. The motor is an integral part of pump. No belting is required, and no extra building is required.

With that information it is possible to obtain the initial investment for a diesel engine and an electric motor installation:

Initial Investment

Comparative Condition	Engine Costs	Motor Costs	Diesel Cost Times Motor Costs
30-hp. diesel 25-hp. motor	$2,151	$ 425	5.0
45-hp. diesel 40-hp. motor	2,821	532	5.3
60-hp. diesel 50-hp. motor	3,466	609	5.7
80-hp. diesel 75-hp. motor	4,111	949	4.3
120-hp. diesel 100-hp. motor	5,871	1,144	5.1

Costs of electric power for farm pumping are given in the following tabulation. This tabulation has been made up for 25-, 40-, 50-, 60-, 75- and 100-hp. motors, but for the sake of brevity only two ratings are included.

Annual Agricultural Power Costs

Annual Load Factor	25-hp. Service Charge	25-hp. Energy Charge	25-hp. Total Cost	50-hp. Service Charge	50-hp. Energy Charge	50-hp. Total Cost
10	$125	$195	$ 320	$225	$ 362	$ 587
20	125	360	485	225	677	902
30	125	491	616	225	940	1,165
40	125	606	731	225	1,171	1,396
50	125	720	845	225	1,402	1,627
60	125	834	959	225	1,628	1,853
70	125	948	1,073	225	1,858	2,083

As an example of an average installation, the following comparison is submitted on a 25-hp. motor and a 30-hp. diesel engine. From an inspection of agricultural power accounts, the average plant is shown to operate on a 20 per cent load factor, which equals 1,752 hours per year.

30-hp. Diesel vs. 25-hp. Motor

	Diesel		Motor	
Initial Cost	$2,151		$452	
Fixed Charges:				
Interest 6%	$129.00		$ 27.10	
Depreciation	215.10	(10%)	30.10	(6.66%)
Taxes 1½%	32.20		6.77	
Insurance 1%	21.51		4.52	
	$397.81		$ 68.49	
Operating Costs:				
Fuel oil	$119.00		.....	
Lubricating oil	13.15		$ 10.00	
Maintenance	39.40		.....	
Belting costs	10.00		.....	
Annual service charge	.....		125.00	
Energy charge	.....		360.00	
	$181.55		$495.00	
Total Annual Cost:				
4c.-fuel oil	$579.36		$563.49	
5c.-fuel oil	609.11		.....	
Cost per Hour:				
4c.-fuel oil	33.1 c.		32.1 c.	
5c.-fuel oil	34.7 c.		.....	

Ordinarily, a "payment out of savings" plan is submitted to the prospective purchaser of a diesel engine. Carrying the comparison of costs still further, the following payment plan may be considered typical:

Payment of Diesel with Savings
(No depreciation considered)

Diesel initial cost, $2,151 ..... 20-hp. diesel
Total annual cost with motor, $563.49 ..... 25-hp. motor
Data based on 4c fuel oil

Year	To Operate Diesel	To Operate Motor	Apparent Annual Savings	Interest on Balance	Net Payment	Balance
1	$235	$563	$328	$129	$199	$1,952
2	235	563	328	117	211	1,741
3	235	563	328	104	224	1,517
4	235	563	328	90	238	1,279
5	235	563	328	76	252	1,027
6	235	563	328	60	268	759
7	235	563	328	45	283	476
8	235	563	328	28	320	156

Under that plan certain facts must be considered. These are:

1. Engine pays for itself in nine years
2. No depreciation fund is set up
3. Customer loses advantage of electric rate reductions
4. Agricultural rates have decreased 40 per cent (1921-1931)
5. No provision is made for failure of foundations, extraordinary maintenance or repairs, such as scaling of the water jacket, etc., which might result in repair costs equivalent to half the initial cost
6. Fuel oil prices are the lowest in years, a situation which may change with improvement in the economic conditions.
7. Diesel operating costs cannot be expected to improve greatly.

This study has been on the basis of paying outright for the diesel installation. On this basis it will be noted that electric power costs are lower than the diesel operation. Often an engine salesman will advance the proposition of a cost of operation which includes only lubricating and fuel oil. Under this condition it is natural that the diesel engine will show costs less than those for the electric motor. Such a proposition includes the payment for the engine out of savings. This may sound reasonable, but the purchaser must remember that he must subtract from the net paid the engine company the insurance, interest on investment, proper depreciation and interest on deferred payments. On this basis we find that with a 20 per cent load factor, it will take nearly ten years to pay for the investment.

As a further precaution, a prospective engine purchaser should realize that he accepts all responsibility for natural mishaps such as fire and floods and, when it is paid for, has a second-hand and probably obsolete engine on his hands.

To safeguard his interest the purchaser should make a thorough analysis of all factors involved in the power obtained from these two sources. Under certain unusual conditions, the diesel engine may be shown as the least expensive but, due to the present low electric rates, the much lower initial cost of an electric motor and the reduced maintenance under electric operation, the electric motor-drive generally will produce the lowest cost power.

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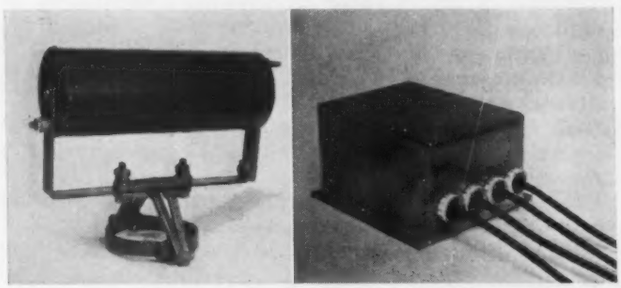
Interference Problems Treated Individually

Sources of Radio Interference Within the Utility System Yield to Corrective Devices Designed for Particular Classes of Apparatus; Control of System Interference Problems at Low Cost Indicated by New Developments

INTERFERENCE with radio reception originating from other electrical apparatus has given rise to increasing numbers of complaints as the number of radio sets in use multiply. Most of these complaints are directed against the electric utility, itself an unjust action because recent studies have shown that much of the interference is caused by equipment entirely without the jurisdiction of the utility and often found on the complainant's premises. Faulty wiring, cheap appliances, or the proximity of interference-producing equipment more often is the source of the trouble than is equipment on the power company's system. However, transformers, switches and insulators, particularly of the older design,

Radio frequency choke coil (left) and capacitor (right) used to suppress disturbances originating in transformer banks

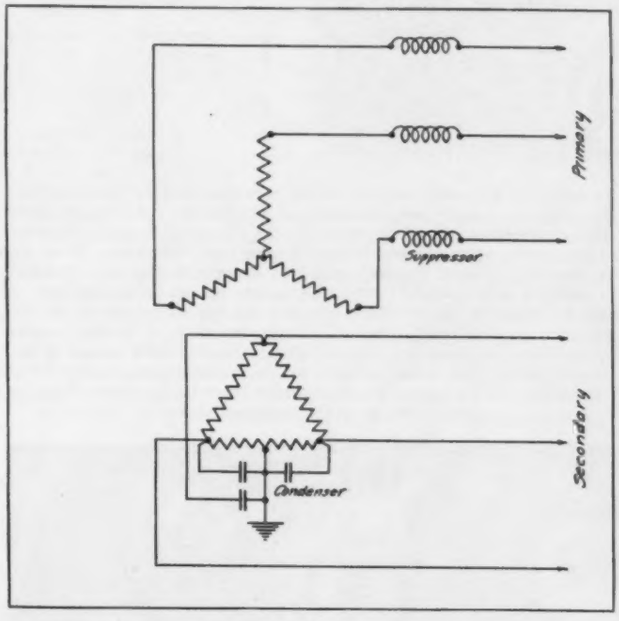


have been shown to be the source of some disturbances and practically all of the public utilities are cooperating in correcting this difficulty.

Several California companies have attacked the problem from the angle of individual treatment for each piece or group of apparatus causing trouble. For example, one common source of complaint was found to originate in certain transformer banks which were feeding disturbances of radio frequency back into the system. To prevent this, radio interference suppressors were designed and applied to each particular transformer bank with very satisfactory results.

The radio interference suppressor consists of a radio frequency choke coil, one such coil being installed in each of the high-voltage leads to the transformer bank. On the low-voltage side a condenser block is connected between the line wires as shown in the accompanying diagram. The choke coils are designed to have a minimum reactance of 50,000 ohms at radio frequency and the condensers have a capacity of 1 mfd. or the equivalent of 1/3 ohm reactance at radio frequency.

These devices when installed on a transformer bank prevent radio frequency disturbances from traveling over the system, over 200 sets being in service at the present time and operating with complete satisfaction. The choke coil and condenser block are illustrated in the accompanying photograph. The choke coil consists of an air core impregnated winding, sealed into an outer bakelite tube. Support for the coil consists of a brass mounting with a yoke at the bottom suitable for mounting on the top of a standard insulator. As the coil is connected in series with the line, this mounting provides an easy means of installation. Condenser blocks are enclosed in a metal container from which four leads are brought out



Schematic diagram for application of radio suppressors

through sealed bushings. Condensers are tested for 10,000 volts and are suitable for use on services not exceeding 2,300 volts.

The suppressor set can be applied to transformer banks of any voltage where the high-voltage current does not exceed 7 amp. and the secondary does not exceed 2,300 volts.

Transformer installations, originally having noise levels beyond the scale of a standard audibility meter, have shown no reading on the same meter after these suppressors were applied to the bank.

Complaints also have been common where high-voltage lines pass through densely populated areas. This situation was met by designing "stop" coils on the principle of the loading coils used in telephone circuits. Sections of the high-voltage line passing through such areas were isolated in regard to radio disturbances by installing a set of these coils at each end of the section, thus preventing disturbances originating from other parts of the system from getting into the isolated section. Within the section itself pin-type insulators were treated with metallic and insulating paint so that interference originating on the insulators was eliminated. Such treatment has to be applied locally to the insulators in the isolated section and, although the technique has not been fully developed, excellent results have been obtained in the past and indications point to a complete solution of this problem in the very near future.

In instances of isolated complaints, such as a rural consumer near a high-voltage line, a transmission line and coupling device has been developed so that good radio reception can be obtained with a remote antenna.

Many engineers feel that present knowledge of high frequency disturbances is insufficient to develop any single method of eliminating such disturbances from the system as a whole. Until such developments can be made, successful methods of reducing disturbances from individual groups of apparatus seem to offer the most satisfactory method of dealing with complaints originating from disturbances on the system itself. The methods described in this article have been developed by the Radio Interference Specialty Co. of San Francisco, Calif.

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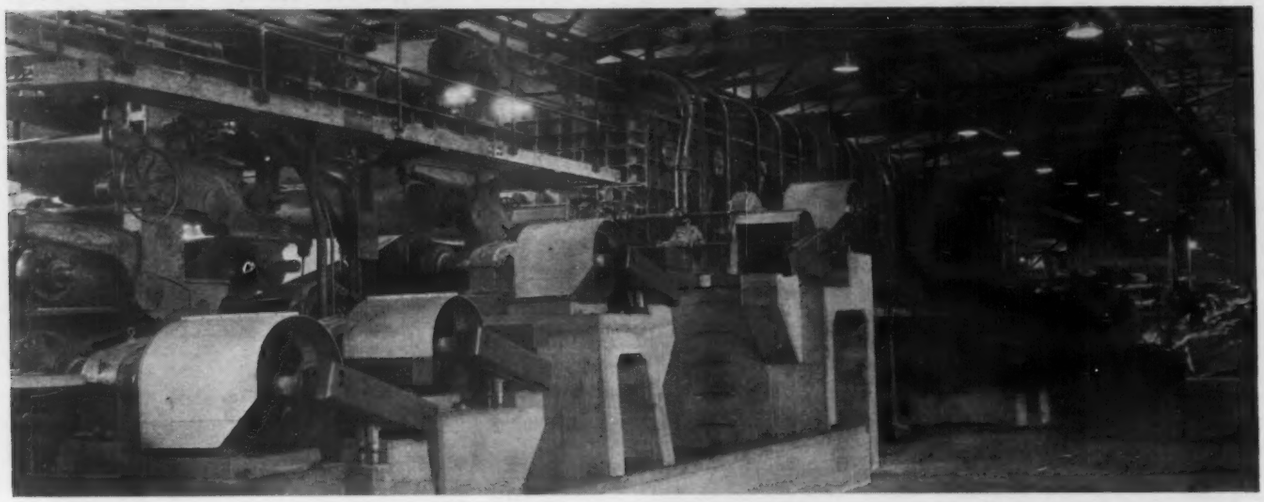
More Power to Portland's Business District

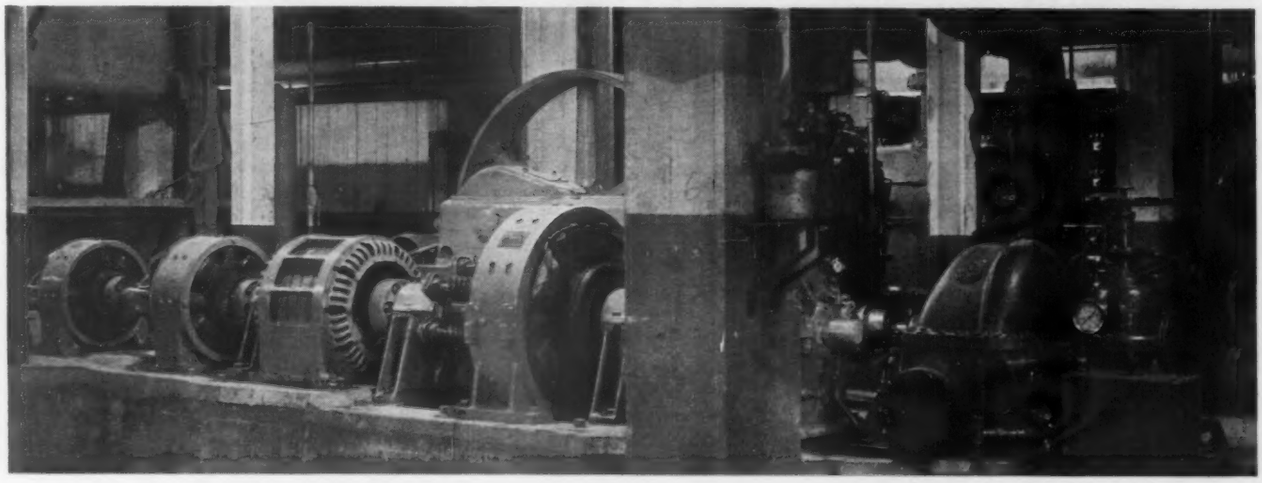
PORTLAND General Electric Co. recently installed the fifteenth 11-kv. cable across the Willamette River. This 1,650-ft. crossing was made with three-conductor, 400,000-circ.mil cable, insulated with 12/32 in. of rubber around each conductor. A 9/64-in. lead sheath armored with No. 4 steel wire was provided as outer protection. Although the preliminary arrangements, such as loading and pulling in the shore end, took from five to six hours, the actual placing of the cable in the river was accomplished in seven minutes from a special barge of the Pacific Telephone and Telegraph Co., as shown.



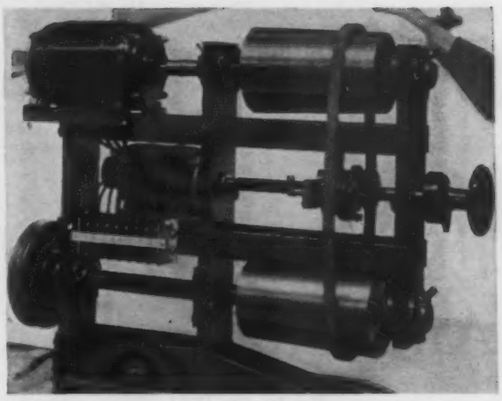
This sectional paper machine at the Longview Fibre Co., Longview, Wash., produces paper ranging in weight from tissue to light board. With this weight variation, a speed range of from 200 to 1,200 f.p.m. is required and the drive must be capable of close regulation, particularly at lower speeds. Ten d.c. motors drive the various sections of the machine, so the control must maintain accurate speed relation between sections to prevent tearing of the paper and must permit individual adjustment of each section's speed to maintain proper tension in the sheet. The General Electric sectional drive using Selsyn motors for actuating the control was selected to meet the exacting requirements of this installation. Selsyn control units may be seen mounted beside each driving motor

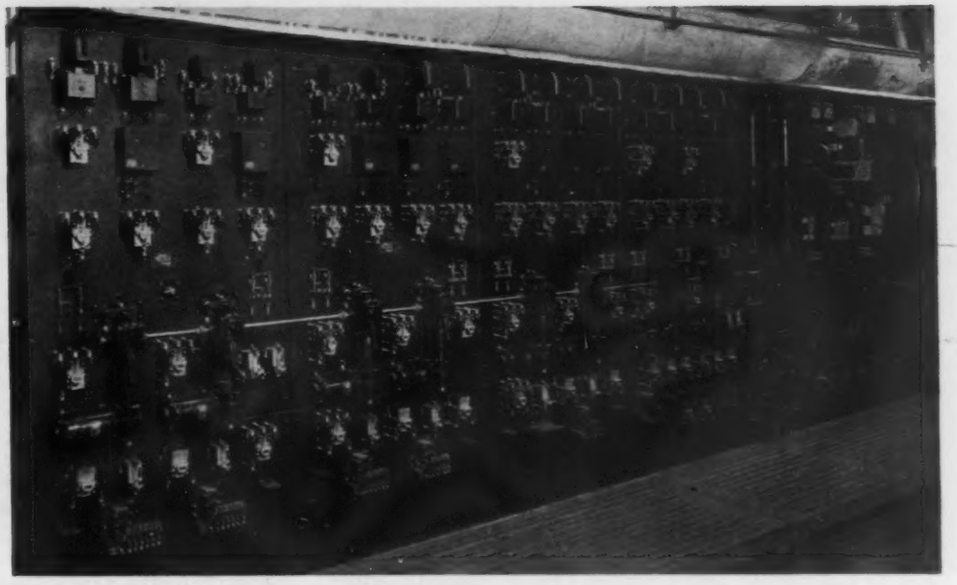
Selsyns Provide Speed Control For Paper Machine

The 5-unit generating set furnishing power for operating the paper machine motors consists of a 300-hp. steam turbine, designed to operate up to 35-lb. back pressure; a reduction gear; a 200-hp., 1,200-r.p.m., 440-volt synchronous motor; a 300-kw., 250-volt, d.c. running generator; a 75-kw. starting generator; and an exciter. Exhaust steam from the turbine passes into a Minton dryer, its control being important because of the wide range of steam volume required in drying tissue paper or light board. An automatic steam control maintains almost perfect steam balance by means of an automatic valve located in the high pressure steam line. Actuated by air pressure controlled by steam pressure in the dryers, the valve admits to the turbine the exact amount of steam necessary to maintain a predetermined pressure in the dryers. If steam flow exceeds the proper requirements of the motors, the synchronous motor generates returning power to the electrical supply. If power requirements exceed the potential energy of the steam flow, the synchronous motor supplies make-up energy to the set. Floating in parallel with outside power, this motor maintains a constant net speed, acting as the turbine governor. Steam in excess of turbine capacity is supplied by an automatic valve in a 35-lb. standby steam line. By using the starting generator to supply power to the winder motor, the initial investment in a motor-generator set was eliminated. Control prevents the winder from being operated during the starting of the sectional drives



Selsyn control units for each sectional motor are belted to the main motor through pulleys such as shown to the left. Two tapered cones (also shown) are belted together, the top cone driving a transmitting Selsyn. The speed of this Selsyn bears a direct relation to the speed of the driving motor, the relation depending upon the point along the axis of the tapered cones at which the driving belt is adjusted. Speed of each of the transmitting Selsyn units on each main motor is checked electrically against a master Selsyn which is driven by a d.c. motor of exceptionally good regulation connected to the main d.c. bus. Speed of this motor varies directly as the voltage of the main generator and, consequently, as the speed of the paper machine. "Draw" or tension in the paper is adjusted by sliding the belt along the cone pulleys. This is done by remote control through a receiving Selsyn motor (shown below the transmitter). This motor is geared to a threaded shaft which carries the belt-moving mechanism. At the operator's control station is placed a crank-operated Selsyn transmitter, shown below, for controlling belt shift on each sectional unit. Turning the rotor of this transmitter causes a corresponding rotation on the receiver unit which moves the belt along the pulleys and changes the speed of the main motor. As long as the master Selsyn and the transmitting Selsyn operate at the same speed, no change in the control circuit occurs

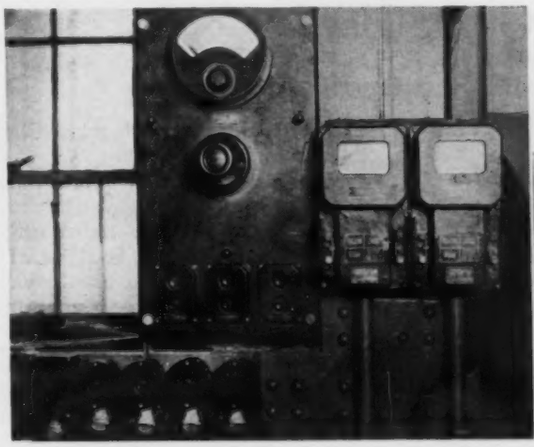




Main control panel for a 10-motor sectional paper machine. A feature of the control is the use of differential Selsyn motors connected between the master Selsyns and each main motor control unit. These differential Selsyns are geared to carbon-pile rheostats in the main motor field circuits. They rotate at a speed equivalent to the speed difference between the master Selsyn unit and each transmitting unit, rotation being in such a direction as to act on the carbon pile field rheostat, changing the field current and making the speed of each sectional motor the same as that of the whole machine. Each section is driven by an individual motor and, as the paper stock is fragile, it is apparent that the speed of each section must be exactly right. If it is too slow, the paper will pile up between the rolls; if too fast, the paper will tear. Also, the paper stock is reduced in thickness and increased in length as it passes through the machine, which makes it necessary that succeeding sections run at higher speeds to maintain a uniform tension in the paper. Thus control for a multi-unit drive of this type must be extremely sensitive and accurate and must permit easy adjustment of any section motor.

Much of the control previously mounted at the location of the main motor can be incorporated on the switchboard if this type of control is used. The differential Selsyn units, one of which is shown for each motor drive, are designed to give approximately the same speed regulation over the entire range of the drive.

The differential Selsyn control system has the advantage of being particularly sensitive, maintaining speed regulation within exceptionally close limits. It utilizes a minimum of moving parts for the control of the paper machine, essentially transmitting torque electrically rather than electric current variations. The carbon pile rheostats provide an infinite number of operating points which, together with the simple, rugged construction of the equipment, greatly reduces maintenance. Because of the simplicity and absence of complicated parts, inspections need be less frequent; accessibility for repairs, when needed, is evident from the fact that most of the equipment is mounted at the switchboard, a feature which also facilitates "trouble-shooting"



The machine is controlled from a number of pushbutton stations located along the side of the room, as shown to the left. All operations of a section can be controlled from this one point. Pushbutton control is one of the factors which enable modern plants to operate large groups of heavy equipment at high speeds with safety and economy

Selsyn transmitter for control of the "draw" or tension in each section. This unit is located at the machine tender's post. Turning the crank causes the belt-shifting mechanism on the main motor control unit to move the belt along the tapered cones, adjusting the motor speed

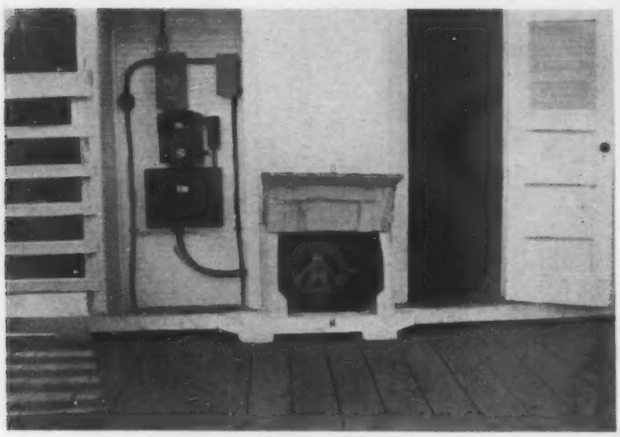
A Department for the Industrial Electrical Contractor — the Motor Specialist

MOTOR FORUM

An Exchange of Ideas on Economic Electrical, Mechanical and Business Problems

Electricity Drives An Auto Ferry

By L. O. B. LINDSTROM
General Electric Company, San Francisco

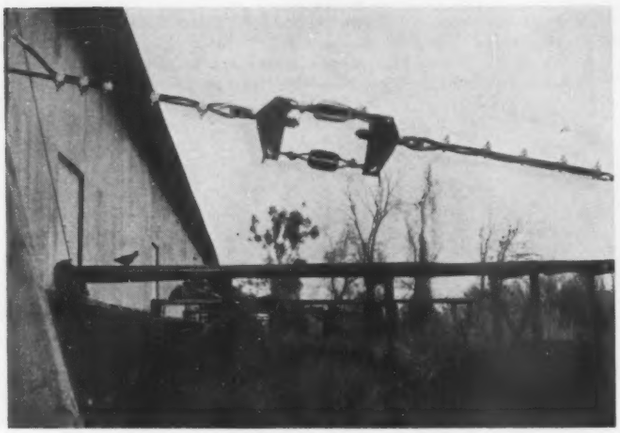


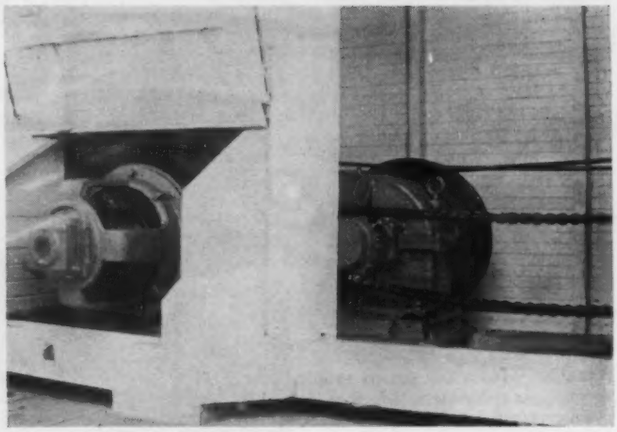
SOMETHING entirely new in marine electric propulsion has been in successful operation in northern California for a little more than a month. It is an electrically-driven automobile ferry across the Sacramento River at the Glenn County Road near Princeton.

This new twelve-car ferry replaces one driven by a gasoline engine. To the best of knowledge, it is the first electrically-driven ferry of this type.

The biggest problem was the trolley system, which consists of the main upstream supporting cable insulated with a ring of insulators at each end. The two ferry support sheaves also are insulated from the ferry and a weighted trolley wheel running between the two sheaves

Strain insulator used on combination trolley and ferry support cable





Left—Control panel on the ferry. Above—Motor and reduction gear. One of the two driving sheaves may be seen

supplies the power to drive the motor. The ground return goes through a special mercury cup on the drive shaft and thence through the drive cable, which is fixed and grounded at both ends.

Further complicating the problem was the fact that the Sacramento is a navigable river, and whenever a boat is to pass, the cables must be lowered to the bottom of the bed. This is true of gasoline engine ferry cables, too, and the conversion to electric drive does not involve extra cables.

Relatively simple, the drive consists of a reduction gear with figure 8 cable sheaves, a type SRE 5-hp., 1,200-r.p.m., reversible, single-phase motor and starting and magnetic reversing control.

The boat speed is approximately 180 ft. per minute, the crossing being made in less than two minutes. The total cost of operation conservatively is estimated to be one-half the former cost; operation to date has more than justified this estimate.

California's Industrial Accident and railroad commissions both approved the installation, and it is now being maintained jointly by Glenn and Colusa Counties.

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No Going Back For His Tools

"WE BROUGHT everything but the telephone" is more than an advertising slogan painted on the side of a new truck recently equipped and put into service by the California Electric Works, industrial electrical contractors of San Diego, Calif. It is a literal expression of the truth. For not only does the truck carry all of the tools that will be required on even an unusual job, but it also carries a large and well ordered stock of fittings, wire, conduit, lamps, fuses, etc.

Conduit and fittings up to and including the 2-in. sizes are carried. On the outsides of the truck are bins, 200 in number, in which material is kept in four gen-

A truck such as this might help even the plumbing business

eral sections, labeled A, B, C and D. In section A are the ½-in. fittings, in section B the ¾-in., in Section C the 1-in. and in section D the 1½-in. and 2-in. fittings. Each section of bins starts numbering from 1 on up. Bin 1 in all four sections represents locknuts. In the same manner the same number of bin represents the same type of material in each of the four sections. Thus it is handy for a man to memorize one set of numbers and apply it to all sizes of fittings.

The conduit is kept in full lengths on the bed of the truck. The interior provides four shelves, one-half of the depth of the truck, to accommodate lamps, externally operated switches, cord, cables, wire in full coil quantities, B.X., flex and other similar items. The other half of the interior accommodates broken coil quantities of wire, a pipe bench, tools, etc.

A box on the running board, 8 ft. long, is used to hold short lengths of pipe, hickeys and special tools.

Even bookkeeping is done on the truck. In writing up a job and charging up material and labor, with truck service, the wireman handling the truck has the bill accepted by the customer's signature each day, leaving a copy with the customer, keeping one copy for the billing department and another copy for the stock room to replenish his material. The stock room then keeps up the stock of material on the truck. The truck is inventoried once each month for complete check up. Cash sales are completed on the job.

This truck has been in service a little over a month and, according to V. R. Knight, manager of the company, "It certainly eliminates trips for small items of material and gives the workman a very flexible supply to handle his job."

Advertising signs on the exterior of the truck and a distinctive red-orange coloring proves to be very effective advertising throughout the city of San Diego.

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Small Shop Benefits From Modernization

LARGE organizations are not the only institutions which can benefit from electrical modernization. In support of this statement study the results recently attained by the Benner & Nawman Sheet Metal Co., of Oakland, Calif. This shop operates with a connected load of 55 hp. which would seem a rather small capacity upon which to make any material saving.

Equipment consists of a 12½hp. welder, a 12½-hp. brake, a 10-hp. shear, a 10-hp. and a 5-hp. line shaft, a 5-hp. shear. Under the original installation, the minimum charges for energy were $1 per connected horsepower for all under 50 hp., and 60c. per horsepower for the excess. At the suggestion of the Scott-Buttner Electric Co., of Oakland, three reversing switches were installed and so connected that only one of the two motors of the same rating could be connected to the circuit at one time. In brief, the reversing switches acted as transfer switches so that it was impossible to have more than half of the total horsepower in the shop on the line at the same time. Under this set-up, the brake could not be operated when the welder was running, the 10-hp. shear when the line shaft was operating or the 5-hp. shear when the 5-hp. line shaft was operating. As the original push buttons were maintained, the circuit merely being connected to the proper side of the reversing switches for each motor, operation of any particular piece of apparatus still is under the control of the workmen, who schedule their work to suit the new layout.

As only 25 hp. of the connected load can be on the line at the same time, the minimum demand charges have been cut 50 per cent, making it possible to pay for the complete installation in less than four months. While such an arrangement would not be applicable to every shop, the success of this installation indicates that the electrical contractor may be capable of correcting some of the high costs of production and that modernization is not confined to any group or concern.

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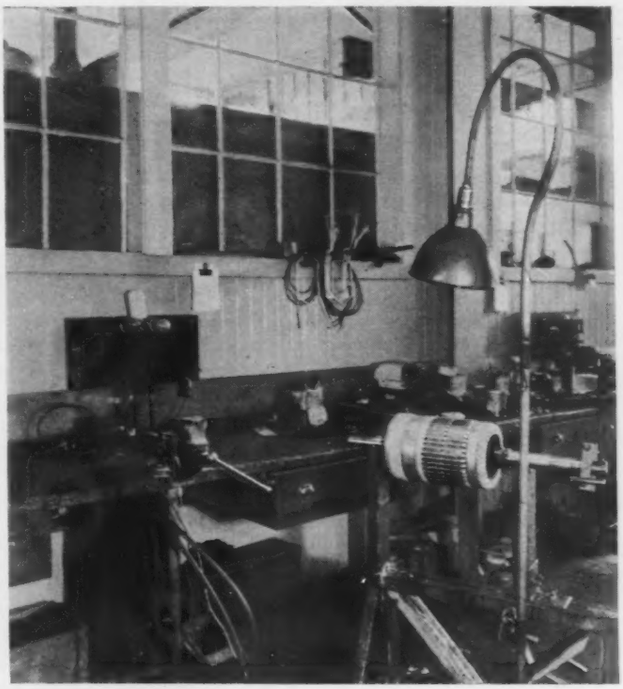
A Workbench Full of Ideas



WORKBENCH arrangement and facilities to help in the small winding and repair jobs vary with the shop. This arrangement at the Buzzell Electric Works, San Francisco, demonstrates several useful articles. At the rear wall is seen the testing board. On the bench itself are portable growlers and testing devices. A large drawer contains the tools. At the right is a sawhorse on which rotors can be mounted. Note the adjustable ends for adapting it to the length of the shaft. The gooseneck crane portable light is a big convenience in concentrating light on the work being done.

P.G.and E. Prepares for San Joaquin Merger; Will Acquire Pacific Public Service

PACIFIC Gas and Electric Co., in two strokes, last month further strengthened its position as the nation's largest independent utility by obtaining from the California Railroad Commission permission to exchange preferred holdings in San Joaquin Light & Power Corp. for those of Pacific Gas and by concluding negotiations for the purchase of Pacific Public Service Co., $32,000,000 Standard Oil Co. of California subsidiary.

While P.G.and E. controls San Joaquin by virtue of majority holdings, the exchange would convert all public holdings in the latter into preferred and common stocks of the former, making possible the avowed intention of P.G. and E. to ultimately merge the two companies and to disincorporate the San Joaquin company.

Terms of the exchange offer essentially are four shares of P.G.and E. preferred for one of San Joaquin preferred, except for the prior preferred of the latter, which also has the option of three P.G.and E. preferred and one common. A. F. Hockenbeamer, P.G.and E. president, estimated that the exchange will effect a saving of $140,000 in dividends, inasmuch as the Pacific Gas preferred yields less.

Coast Counties Sale Awaits Commission Approval

Pacific Gas and Electric officials have not committed themselves, but the purchase of Pacific Public Service, made public by Standard Oil, will be negotiated by an exchange of stock, if the approval of the Railroad Commission is obtained. Standard owns 90 per cent of the voting common of its subsidiary and Pacific Lighting Corp. the remaining 10 per cent.

Negotiations have been pending for some time, but since P.G.and E. fundamentally was interested in acquiring only one Pacific Public Service property, Coast Counties Gas and Electric Co., it was questionable just what would be done with the others, which include ice and cold storage facilities, a bottled water firm, and Butane properties in California, Oregon and Washington. It is understood that these properties will be taken over in their entirety, although some (notably the Butane companies, which have been losing money) may be disposed of eventually.

Coast Counties Gas and Electric Co., though it has a small steam station and hydro plant in Santa Cruz, Calif., buys about 3 million kilowatt-hours monthly from P.G.and E. to serve its 19,701 customers. By acquiring it, P.G.and E. will have every major electric system in northern California, save the Vallejo Electric Light & Power Co.

San Joaquin Rates Filed Under Protest

Reduced rates on San Joaquin Light & Power and Midland Counties Public Service corporations' lines, as ordered by the Railroad Commission, (ELECTRICAL WEST, May 1, 1932, et seq.) were filed on July 1 by A. E. Wishon, president, and were accompanied by a letter of protest. The latter action preserves the utilities' rights in the courts, should the case be appealed there.

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L.A. Right-of-Way Suit Battled in Court

When permission to construct a 132-kv. transmission line over a purchased right-of-way in Huntington Park and South Gate, suburbs of Los Angeles, could not be obtained otherwise, Los Angeles' Bureau of Power & Light took the matter to superior court, where the case has been battled for more than a month.

The defendant cities have taken the stand that the line can be constructed wholly within Los Angeles city limits, through the industrial zone and along Los Angeles River bed to a large extent, and that there is no necessity, either from an engineering or community standpoint, that the line, which is contended to be highly hazardous and destructive of property values in their communities, should be installed across residential districts of the defendant cities.

Under cross-examination, E. F. Scattergood, chief electrical engineer and general manager of the bureau, admitted that the route within the city limits of Los Angeles was shorter and more direct, but he insisted that the proposed route, through the suburbs, is more practicable. He also contended that an underground installation would be less effective than the overhead line, and would be far more costly.

It was indicated that the decision rendered will be important in that it will establish a precedent.

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West Seeks Millions From R.F.C.

When President Hoover, on July 21, signed into law the gigantic relief bill which increases Reconstruction Finance Corp. resources from $2 billions to nearly $4 billions, he opened the way for many Western construction projects.

Already in Washington are J. D. Ross, Seattle City Light superintendent, who is asking for $3½ millions to finish the Skagit development; representatives of southern California's Metropolitan Water District, who are asking for $100 millions; and a representative of the San Francisco Bay and Golden Gate bridges, who seeks $110 millions for the two structures. Los Angeles city and county agencies have moved to ask for $42 millions, $32 millions for the Bureau of Power & Light Hoover Dam

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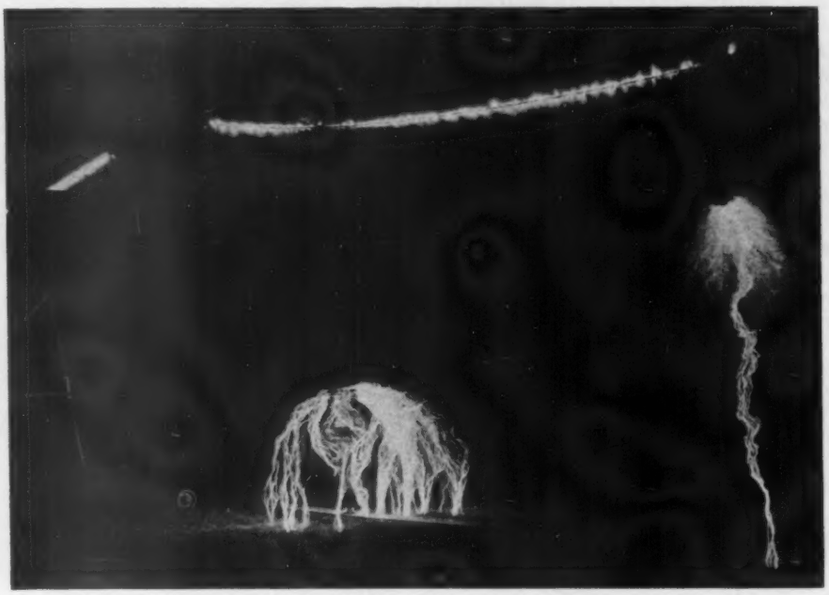
Ohio Brass Stages Spectacular Tests



One of the many interesting displays witnessed at the Ohio Brass Co. high-voltage laboratory, at Barberton, Ohio, by more than 750 guests and delegates to the A.I.E.E. convention at Cleveland, Ohio, during June, was that shown above, using a damped wave to study the performance of the electrostatic field around an insulator. Arcs were obtained simultaneously over an insulator only 54 in. high and across a gap 168 in. to ground, as may be seen

No Paradise for Salesman

Silverton, Colo., has emerged from its blanket of snow ("Electrical West", June 1, 1932, p. 571) and joined the national refrigeration campaign, after being cut off from the rest of the world for several months. But there still is plenty of snow around, so the sale of a refrigerator by Silverton Electric Light Co. must require some fast talking on the salesman's part

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transmission line and $10 millions for county flood control projects. Long Beach has joined with Los Angeles in asking for $1½ millions for breakwater construction. The State of Washington also has been urged to ask for $7 millions to start work on Grand Coulee dam.

If Mr. Ross fails to obtain help from the Government, it may be necessary to ask Seattle voters to pass a bond issue to obtain necessary funds, he indicated.

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Utility Fights Seattle Occupation Tax

In a suit filed by Puget Sound Power & Light Co., the Seattle city ordinance levying an occupation tax on public service corporations is branded as "discriminatory and arbitrary" in its failure to tax City Light, the municipal plant. Pacific Telephone & Telegraph Co.'s suit against the same ordinance is now pending.

City Light, while soliciting customers of the privately-owned company, already paying taxes, is itself tax free and not affected by the new ordinance. This, Puget Sound officials charge, is unfair competition and jeopardizes the franchise of the private company. They also contend that the company is subject to control only by the state department of public works.

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Oregon Grange Proposes Power Amendment

Bonding of the State of Oregon for $60 millions, or 6 per cent of the probable assessed valuation of the state, for developing water power, is proposed by the Oregon State Grange in its initiated constitutional amendment to be voted upon in November. Declaiming against high taxes and debt, the Grange advocates state-guaranteed bonds for developing political water power to compete with private concerns now operating in the state.

As it reads, the purpose of the bill is: To require all water for power development and water power sites now or hereafter owned by the state to be held by it perpetually; and authorizing the state: to control, develop, lease water power and power sites; control, use, distribute, sell, dispose of electric energy; separately or with the United States, other states or state subdivisions; acquire from such sources water power and electric energy; fix rates and charges for water power and electric energy; loan the state's credit and incur indebtedness not exceeding 6 per cent of assessed valuation; form a commission of three nonpartisan elected members to administer these powers.

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Work Proceeds on L.A. Bureau Steam Plant

Although officials of the Los Angeles Bureau of Power & Light and those of Southern California Edison Co. have appeared before various civic bodies to present their sides of the controversy on the Wilmington steam plant of the Bureau, (ELECTRICAL WEST, July 1, p. 35) E. F. Scattergood, bureau general manager, reports that the tunnel excavation and other preliminaries rapidly are nearing completion. This would indicate that the municipal organization intends to refuse the Edison offer and build the plant.

Burdette Moody Re-Employed

Burdette Moody, former general agent of the L.A. Bureau of Power and Light, has been returned to that post by the board of water and power commissioners. His position was abolished last year by a former board for his asserted part in the removal and destruction of departmental records.

At the same time, the board moved R. K. Simondson from his position as executive assistant to the board to that of efficiency and personnel man, giving the executive assistant's position to A. B. Prior, former board member.

Three Companies Get Aqueduct Power Contract

Electric energy required in constructing the Colorado River aqueduct of the Metropolitan Water District will be supplied jointly by Southern California Edison Co., The Southern Sierras Power Co. and Los Angeles Gas and Electric Corp. The district will pay an energy charge of 5 mills per kw.-hr. for all energy used, a fixed monthly payment of $1,500 and a minimum monthly charge of $3,000, this latter to include the fixed charge.

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Investigate Byllesby Companies in Oregon

Although no decision in the case involving rates, charges and practices of Northwestern Electric Co. has been made by the Oregon public utilities commissioner, (ELECTRICAL WEST, May 1, p. 256, et seq.) engineers employed by the commission have been sent to Albany, where they will conduct an investigation of the books, records and accounts of Mountain States Power Co., and to Medford, where a similar investigation of California Oregon Power Co. will be made.

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California Utilities Sued by Farmers

Suits for damages totalling $5,913,239 have been filed in the Stockton, Calif., superior court by San Joaquin valley farmers against five irrigation districts, Southern California Edison Co. Ltd., San Joaquin Light & Power Corp., Miller & Lux and other concerns. The farmers claim illegal diversion of water has deprived them of irrigation water, damaging their lands to the extent of $1 million in the last three years. The remainder of the judgment sought comprises anticipated damages.

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Babcock & Wilcox Gets Huge Hoover Dam Contract

Babcock & Wilcox Co., lowest bidder, was awarded the contract for fabricating the 30-ft. diameter steel pipe to be placed in four pressure tunnels at Hoover Dam. The bid was $10,908,000.

Because the pipe is so large, each section weighing approximately 150 tons, a fabricating plant will be built by the company one mile above the dam. Each section will be taken to the brink of the canyon on a flat car and lowered down the 1,000-ft. cliff by a cableway.

Counsel for A. O. Smith Corp., unsuccessful bidder, notified the Dept. of the Interior that it will bring suit for in-

junction, alleging patent infringements. The corporation declares that the specifications require the use of Smith patents. Babcock & Wilcox have let it be known that if A. O. Smith Corp. does not sue them, they intend to sue the Smith corporation for libel.

In taking the contract, Babcock & Wilcox furnished a $6 million bond indemnifying the government.

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Business Upturn Seen In Month's News

While industrial leaders from coast to coast reported signs of business recovery last month, the West had concrete evidence that "things are picking up".

For the sixth consecutive year, Pacific Gas and Electric Co. exceeded quota in its annual spring range and water heater campaign. Closing on June 30, the campaign resulted in a sale of 2,582 units, or 103.3 per cent of quota, in 90 days. Range sales totaled 1,622, against a quota of 1,700, and water heater sales reached 960, against an 800 quota. Approximately 50 per cent of the ranges and 30 per cent of the water heaters were sold by dealers. The company, cheered by the showing, has extended the drive for another three months.

Washington Water Power Co. sold 225 ranges in a six weeks campaign.

Public Service Co. of Colorado has just installed service in nearly a score of reopened mines and new processing mills. The biggest operator, Chain-O-Mines, at Idaho Springs, Colo., will add approximately 300,000 kw.-hr. to its monthly load.

Utah Copper Co. announced the reopening of the major copper camps in the state, with about 1,500 men returning to work and considerable electrical load added.

General Electric Co. reported that, while both gross and net earnings for the first half of the year decreased from 1931 figures, the company more than earned its recently reduced dividends.

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Red Seal Contest Winners Announced

Winners for the first quarter of the Red Seal contest, conducted by the Pacific Coast Electrical Bureau, were announced by Victor Hartley, assistant managing director, on July 10. The first prize power company award was won by C. H. Edman, Red Seal salesman for the San Joaquin Light & Power Corp. at Madera, Calif. Mr. Edman made 535 per cent of his quota for the first quarter. The second prize of the power company award was won by D. C. Miller, of the Midland Counties Public Service Corp. at San Luis Obispo, who made 101½ per cent of his quota. The third prize was won by W. J. Simpson, Jr., of the Pacific Gas and Electric Co., San Rafael, who made 91 per cent of his quota for the quarter.

The silver plaque for the power company district making the best showing was awarded to the Madera office of the San Joaquin Light & Power Corp. for the first quarter.

The contractors' awards were as follows: For Pacific Gas and Electric Co. territory, H. R. Eklund, electragist at San Rafael. Coast Counties Gas & Electric Co. territory, Central Electric Co., of Watsonville. The San Joaquin Light & Power Co. territory, S. S. Olsen, of Madera. For the Southern California Edison Co. territory, Kuster & Wetzel, of Long Beach.

For the San Diego Consolidated Gas & Electric Co. territory, the prize was split equally between four contractors who tied for first place. These were Gans Electric Co., Carlsbad; Bay Electric Co., San Diego; E. H. Dietrich, Escondido; and W. D. Hall Co., El Cajon. Singularly enough, another four-way tie resulted in The Southern Sierras Power Company territory. Again the prize was split between four contractors, namely: S. and S. Electric Co., San Bernardino; F. B. Pickering, Riverside; Walter V. Pittman, Riverside; and Ted Frazen, Corona.

Mr. Hartley reports that the showings from all parts of the state are excellent, considering the small amount of building being done, and indicate that a larger percentage of homes wired are being Red Seal-wired.

Let Garbo Go Home—Here's a New Star

MOVIES set the style for American home furnishings. When the lady of the house sees before her eyes what is the very ultra of interior decoration, a yearn is set up in her bosom for the same thing in her modest bungalow. Thus have divans, coffee tables, modernistic bookcases and table lamps, bathrooms and kitchens been established as the very chiefest of necessities for even the small home or apartment.

To George Belsey Co., Ltd., General Electric refrigerator and range distributor of Los Angeles, can go the credit for having made the electric range "arrive" in the movies. In a recent Warner Bros. feature starring George Arliss, "A Successful Calamity", an all-electric kitchen was shown for the first time in film history. From this attractive kitchen scene came a second feature starring Ruth Chatterton, "Children of Pleasure", and the electric kitchen was used again. The scene pictured above was from that picture, and shows Maxine Elliot Hicks and Ivan Simpson in front of two Hostess model ranges placed together to make a double-sized range for a large kitchen.

The Belsey organization does the installation and service work in connection with such sets. In this manner it is helping to develop a market for electric ranges far beyond the boundaries of its territory, one which will be capitalized upon by dealers everywhere.

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Westinghouse Employees Sell Millions in Drive

Complete reports on the Westinghouse Electric & Mfg. Co.'s employee sales campaign shows total sales of $2,600,000, with 54,500 sales to the 68,000 prospects. Pacific Coast divisions, during the two months, sold $150,000 worth of appliances, including 400 refrigerators and 200 ranges.

Four-fifths of this business, it is estimated, was created by the campaign, revealing the nation's great latent buying power. The annual power consumption of the appliances sold will be approximately 30 million kw.-hr., or some $780,000 worth of electricity.

Reports on the General Electric Co. campaign are not completed, but officials of that company predict results just as startling.

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¶ ONE-HALF MILLION DOLLARS in insurance to protect Seattle City Light from losses in case of accidents to tourists or sight-seers at the Skagit development will be purchased by the city.

¶ LARAMIE, WYO., is levying a license tax of $2,000 monthly on companies selling electricity in the city.

Contractor Dealer Inspector

Law and Barbecue Interest Santa Clarans

An interesting two-hour discussion of legal points in contracts and business law, by Chesley M. Douglas, assistant district attorney, San Jose, and a stag barbecue in the Los Gatos hills, rendered two recent meetings of the Santa Clara County (Calif.) Electrical Development League the most interesting meetings of that organization during the past month.

Mr. Douglas spoke at some length on the law of contracts and the law of fraud, answering specific questions as to interpretations and points of difference. Particularly, he stressed the necessity for reducing all contracts and agreements to writing, as it becomes very difficult to prove orders or contracts given orally only. Even an oral agreement should be followed by a signed memo, to protect the contractor.

He also discussed signed contracts and the difference of opinion which still exists as to when something is a fixture and when it is not. He stressed the point that if removability is to be guaranteed it must be written into the contract very specifically. With this, also, he stressed the importance of getting the signatures of the proper parties so that the responsibility could be traced right back to where it belongs.

The barbecue was a very successful affair with a surprisingly large attendance. President Roy Butcher appointed Bruce Brownlea, Graybar Electric Co., chairman of the committee consisting of himself and George Thompson, The L. H. Bennett Co., Ltd., and W. Simpson. The barbecue was held at the Gabriel Ranch, Saturday afternoon, June 4.

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Contractor Invents Appliance Tester

P. H. BULLOCK, proprietor of the Bullock Electric Co., contractor and dealer of Kelso, Wash., has designed and patented a counter testing device for electrical heating appliances. The circuit arrangement has been worked out in an ingenious manner, so that when the defective appliance is plugged in, and four switches are thrown over in order, lights under transparent windows will indicate whether the appliance has a short circuit, open circuit or ground. Of if by chance the customer has brought in a perfectly good appliance (the trouble perchance being in the cord, which she left at home) the fourth switch when thrown indicates "O.K."

Aside from the advantage to the repair man in knowing instantly what is wrong with the device, this tester has a decided merchandising value. Ordinarily, when a customer brings in a defective appliance and the repair man or proprietor is not there, the clerk or perhaps the proprietor's wife who is running the store does not know what is wrong, if anything, and it is necessary to tell the customer to come back later for information as to the trouble and whether it can be remedied. Now, anyone can plug it in and give her the answer on the spot. This quick service appeals to the customer and gives her the feeling that this store has the equipment that will enable it to give adequate service. In the future, when other appliances go wrong, the customer is apt to remember the store where they have the tester, and go back there.

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H. H. WALKER, Los Angeles electrical contractor, was awarded the contract for wiring the new California National Guard Armory at Pomona, Los Angeles County, by the State Department of Public Works.

SYVERTSEN & SONS, electrical contractors and dealers at Marysville, Calif., have been taking advantage of the present opportunity for the complete remodeling of their store and improving the merchandising display facilities.

L. H. BENNETT, president of The L. H. Bennett Co., Ltd., San Francisco, was the principal speaker at the June meeting of the San Joaquin County Electrical Development League at Stockton, Calif. Mr. Bennett spoke on merchandising and markets, with particular reference to refrigeration. After Mr. Bennett's talk, President Ray Bass, Commercial Electric Co., Stockton, opened the meeting for a general discussion, particularly of range merchandising.

G. S. STANLEY and J. E. Regan have opened a retail radio and refrigerator store at 1209 Market St., San Francisco.

PERRY WATSON, ingenious proprietor of the Gridley Electric Co. at Gridley, Calif., not only devises moving displays for his Christmas windows but is sometimes called upon for unique public service. A friend of his complained that a neighbor persisted, despite all pleas, in playing his radio loudly during the middle of the night. Mr. Watson rigged up an old Ford coil and battery with which this friend could provide sufficient radio interference to discourage his noisy neighbor.

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Runs for State Assembly

Grover A. Grider, former mayor of Stockton, California, and at the present time a member of the City Council, has announced himself a candidate for Assemblyman from District No. 11. This district comprises the area about the City of Stockton. Mr. Grider is proprietor of the Grider Electric Co. of Stockton and has for many years been prominent in civic affairs.

To Regulate Bid Peddling

Carlos W. Huntington, director of the California State Department of Professional and Vocational Standards and administrator of the California contractors' license law, in his June, 1932, report to the governor, said, "In addition, we have received widespread approval to our announced desire of supporting such measures as may be proposed to the 1933 session of the Legislature to enable us to cope with the practice of bid peddling, which has assumed the proportions of a racket.

"We are also making a study of the contractors' act with a view to recommending other amendments to the legislature which will clarify and strengthen the act."

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BELIEVE IT OR NOT, E. E. West, recently appointed city electrician for the city of Colton, Calif., is a subscriber to ELECTRICAL WEST. This appointment carries with it the responsibility for the city power plant. Mr. West was in the electrical department of the California Portland Cement Co. at Colton for several years.

EARL WATSON, former Pacific Gas and Electric Co. employee, recently bought out the Russell Electric Co. at Colusa, Calif.

DEMGAARD ELECTRIC CO., at Williams, Calif., recently enlarged its store to accommodate a more extensive display of refrigerators recently added to its line.

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Pomona Pioneer

Frank H. Owen, pioneer motor specialist of Pomona, Calif., has uses for "Electrical West" other than as a fan during a hot spell. He has just moved to new and much larger quarters at 453 North Towne St., Pomona, where the two-window front of the building and large central entrance allow service cars to drive right into the shop. Associated with Mr. Owen are A. G. Anderson, shown above, and O. W. Hill, all of whom are known to users of electric motors throughout the "Orange Empire"

Personals

Wallis Retires; Harper Graybar Pacific Manager

WITH the retirement of Edward J. Wallis, since 1916 Pacific District manager for Graybar Electric Co., Harry L. Harper, Los Angeles manager, has been moved forward to succeed Mr. Wallis. Announcement of Mr. Harper's appointment was made by F. A. Ketcham, president of the Graybar company, who recently visited the Pacific Coast.

Under a policy of the company, the district headquarters will be moved from San Francisco to Los Angeles, with Alfred H. Nicoll, sales manager of the San Francisco district, remaining as San Francisco district manager.

Wallis With Graybar For 36 Years

Just 36 years ago, upon graduating from the University of Rochester, Mr. Wallis became a regular employee of the (then) Western Electric Co. He was stationed in New York as a price clerk. In 1897 he was added to the Chicago staff; in 1898 he became Chicago chief clerk—a quick rise which he ascribes, characteristically, to Spanish-American War casualties.

From 1902 to 1906 he was again in New York. He visited San Francisco after the fire to check up on the loss to the local branch. In 1908 he was made Southern District manager, with headquarters at Atlanta, Ga., coming to San Francisco in 1916 as successor to Fred Leggett, then Pacific District manager.

Harper Prominent in Los Angeles

Harry Harper, new Graybar Pacific head, is a veteran of 29 years' service in the electrical supply field. He has been with Graybar and its predecessor, Western Electric, since 1903, when he went to work for the latter company at Kansas City, Mo., as a shipping clerk. Before coming to Los Angeles in 1919, as manager of the supply department, he had served the company in many capacities in the Middle West.

In 1921 he conceived the Los Angeles Electric Club and was elected its first president. He has been a member of the executive committee, P.C.E.A., for three terms, was twice a member of the executive committee of the National Electrical Wholesalers' Assn., and has been a director of the Pacific Coast Electrical Bureau and state chairman of the appliance merchandising committee for the last three years.

He has held many important chamber of commerce posts, for the past two years being chairman of the exploitation and expositions committee of that body. He was vice-president of the organization which directed La Fiesta de Los Angeles last year and its present chairman of the executive committee of the citizen's committee for the Olympic Games.

HARRY L. HARPER

EDWARD J. WALLIS

ALFRED H. NICOLL

Neilsen Appoints Rocky Mountain Section Heads

AT THE Rocky Mountain division, N.E.L.A., managers' conclave, during the week of June 22, Division President W. W. Nielsen, New Mexico Power Co., made appointments to conform with changes in the national organization plan. Under this plan, W. D. Johnston, Mountain States Power Co., becomes chairman of the Economic Section, which supplants the Public Relations Section; H. L. Pinkerton, Albuquerque Gas & Electric Co., who had been chairman of the Commercial Section, was named head of the Sales Promotion Section; and Henry A. Mitchell, Public Service Co. of Colorado, was appointed chairman of the Accounting Section to replace C. C. Baker, Colorado Central Power Co.

Discussion at the meeting brought out the fact that Rocky Mountain companies are adhering closely to the merchandising principles and code of ethics adopted several months ago. Most of the companies have added carrying charges, eliminated trade-in allowances and are conducting business on a 24-month instead of a 3-year basis.

W. H. Clark, president, Southern Colorado Power Co., announced that he would begin immediately to organize for the 3-year electric range campaign. He recently was appointed regional director for this activity.

An economy measure was adopted whereby Class A members' dues are reduced from one-thirtieth to one-sixtieth of the gross, effecting an annual saving of several thousands of dollars to those companies affected.

Managing Director George E. Lewis announced that plans are well under way for the annual regional convention, to be held at Estes Park, Colo., on Sept. 12, 13 and 14.

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RODNEY DOERR has been placed in charge of the commercial and industrial lighting activities of the Pacific Gas and Electric Co., it was announced last month, and will also have charge of street lighting. W. P. Bear, who has been in charge of these departments, will devote himself to special assignments. John Wrenn will take over the refrigeration activities of Mr. Doerr, in addition to his own air conditioning work.

MRS. JEANETTE I. REES, Southern California Edison Co. Ltd., P.C.E.A. women's committee head, has been selected to serve as chairman of the combined Pacific Coast Gas Assn. and P.C.E.A. women's committee, with Mrs. Anne Kendrick, Southern Counties Gas Co., as vice-chairman. Subcommittee chairmen are: Speaker's bureau, Marvel Murray, Los Angeles Gas and Electric Corp.; library bureau, Mary Caroline Lynn, San Diego Consolidated Gas & Electric Co.; home service, Verda Rarick, Southern California Edison Co.; safety and first aid, Beulah Brown, Pacific Gas and Electric Co.; benevolences, Clyda Weems, San Joaquin Light & Power Corp.; debates and dramatics, Edith Hammond, San Joaquin Light & Power Corp.; club relations, Bertha J. Dale, Pacific Gas and Electric Co.; and publicity, Ella I. Hoeft, Southern California Edison Co.

W. J. DELEHADY, who has been General Electric's representative in Sacramento, Calif., has been transferred to the company's San Francisco office, where he will specialize on floodlighting. Taking Mr. Delehady's place at Sacramento is Stanley S. Scarfe, who has been the Fresno, Calif., representative in charge of central station contacts. A. D. Bragg remains in charge of the company's Fresno office.

KENNETH CURTIS, president, Curtis Lighting, Inc., was in San Francisco during the recent Shrine convention.

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H. B. Sewall Promoted By Puget Sound

Harry B. Sewall, for 14 years manager of Puget Sound Power & Light Co.'s Northern district, with offices at Bellingham, Wash., has been appointed manager of purchasing for that company, with offices in Seattle. W. M. Bird, a division manager of the Seattle office, succeeds Mr. Sewall as Northern district manager.

Before leaving Bellingham, Mr. and Mrs. Sewall were honored by a dinner dance given by the women's committee of the Puget Sound company. More than 300 fellow employees attended. Mr. Sewall, on this occasion, was presented with a wrist watch by members of the Northern district.

Fisher Prominent on Pacific Coast

ELECTED president of the P.C.E.A. at its June convention, R. E. Fisher, vice-president of Pacific Gas and Electric Co. in charge of public relations and sales, has played a prominent part in electrical activities on the Pacific Coast.

He first entered the employ of P.G. and E. in 1911, becoming manager of the commercial department ten years later. In 1922 he was elevated to his present position.

Though Mr. Fisher is a native of Kansas, he received his technical education in California. He served for two years as chairman of the Pacific Coast Electrical Bureau, has been president of the Pacific Coast Gas Assn. and of the San Francisco Electrical Development League. He is a member of the aviation committee, United States Chamber of Commerce, and a director of the California chamber. He also has been active in N.E.L.A. work.

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W. A. Hillebrand Joins U. C. Staff

IN RETURNING to academic work as a professor of electrical engineering at the University of California, Berkeley, W. A. Hillebrand, a member of the Ohio Brass Co. staff since 1919, also returns to the district in which he first entered the electrical profession.

After graduating from Cornell in 1905, Mr. Hillebrand took extra work at Stanford University and joined Western Electric Co. soon after the San Francisco fire. Later he became an instructor at Stanford under Dr. Harris J. Ryan, a professor of electrical engineering at Oregon State College and, in 1914, entered the employ of Pacific Gas and Electric Co.

In 1919 he joined Ohio Brass Co. as a commercial engineer, centering his activities on the Pacific Coast. In 1925 he went to Barberton, Ohio, as consulting engineer with the insulator division of that company.

Mr. Hillebrand assumes his duties at the university during this month, but will continue to do consulting work for Ohio Brass Co.

He is a member of A.I.E.E. and American Institute of Radio Engineers.

P. G. and E. Service Badges Awarded 32

Thirty-two veteran employees of the Pacific Gas and Electric Co. gathered at the Clift Hotel on Friday, July 15, as luncheon guests of the company and were presented with badges representing from 15 to 30 years of service. These employees constitute the veterans' group out of the 133 general office employees who are receiving service medals, the others having from 5 to 10 years' service.

Badges, awarded by the company in recognition of long-time service, are now held by more than 68 per cent of all employees. Twenty-two employees have been with the company for 40 years, 23 for 35 years, and 65 for 30 years. Including all divisions of the company, 610 service badges were issued in mid-year.

At the July 15 luncheon, the following employees received badges:

30 Year: L. P. Cornell, W. H. Spaulding.

25 Year: Wm. Forrest, J. S. Ryan, H. A. Patton.

20 Year: R. E. Ballew, Effie M. Brandt, M. K. Burnham, C. P. Cutten, I. C. Frickstad, R. A. Gunther, A. E. Hassmer, A. T. Kelly, J. A. Koontz, J. M. Mayfield, F. S. Myrtle, E. G. McCann, Daniel O'Connell, F. J. Pazak, R. D. Shea, F. B. Sherwood, H. E. Tickner, D. H. Veirs, and W. F. Vincent, Jr.

15 Year: E. W. Hodges, Theresa F. Jermyn, J. H. Martin, H. B. Murphy, I. J. Plette, R. F. Thomas, J. C. Tice, and Dorothy Wise.

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A. J. SCOTT, purchasing department, The Southern Sierras Power Co., has been appointed district storekeeper for the company at Riverside, Calif.

FRED A. MULVANEY, Pacific Coast manager of R.C.A., Radiatron division, has resigned from that company to become associated with Irving Lundborg & Co., members of the San Francisco Stock and Curb exchanges. Previous to his affiliation with R.C.A., Mr. Mulvaney was San Francisco sales manager for General Electric Supply Corp.

W. W. NIELSEN

W. A. HILLEBRAND

R. E. FISHER

Obituary

WALTER B. CLINE, chairman of the board, Los Angeles Gas and Electric Corp., died of a heart ailment on July 21 at his home in Beverly Hills. He had been ill for about ten days and passed away while asleep.

Mr. Cline was born 69 years ago in Sacramento, Calif., and spent much of his early life in San Francisco where, with C. O. G. Miller, he formed Pacific Lighting Co. Going to Los Angeles when 26, Mr. Cline negotiated the purchase of Los Angeles Gas Co., later acquiring Los Angeles Electric Co. In 1904, the companies were consolidated into the present Los Angeles Gas and Electric Corp.

Mr. Cline remained president of the corporation until 1924, when he retired from active direction and assumed the honorary post, which he held until his death.

He was a member of many Los Angeles clubs, was prominent in civic affairs, and took an active part in the work of the National Electric Light Assn., American Gas Assn., Pacific Coast Electrical Assn. and Pacific Coast Gas Assn.

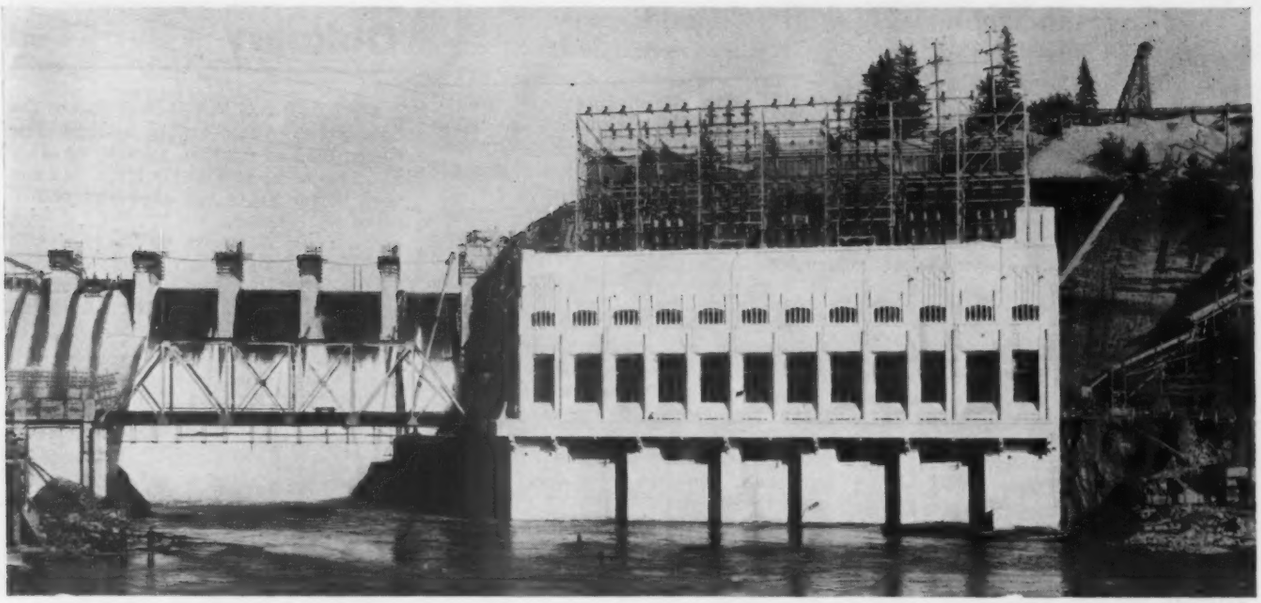
BERT F. FULLER, formerly manager of the Frank Adam Electric Co. in the San Francisco and northern California area, died on July 7 after a protracted illness. He had been ill since leaving the employ of the Frank Adam Company, and for the past several months had been confined to a sanitarium near Burlingame, Calif.

Mr. Fuller was known to electrical contractors, manufacturers and wholesalers throughout California and was active in attempting to form an informal association of switchboard manufacturing representatives in the San Francisco district. He originally was associated with George Cutter Co., and when that firm was absorbed by Westinghouse Electric & Mfg. Co., he remained for many years as a specialist on switchboard design.

W. R. HENDRY, Seattle manufacturers' representative, died at his home in that city last month. He had been in the electrical field for 25 years, since 1911 as head of the firm which bears his name.

EDWIN BEARD HENDRIE, for 40 years president of Hendrie & Holthoff Mfg. and Machinery Co., Denver, died on July 15 after a short illness. He was 85 years of age and, until two years ago, had maintained an active interest in the firm, of which he had been a partner for half a century.

F. D. McKINSTREY, illuminating engineer of the Los Angeles Bureau of Power & Light, was killed in an automobile accident in Los Angeles on July 7. He was prominent in Illuminating Engineering Society activities, conducted several lighting schools in cooperation with other Los Angeles utilities, and founded the lighting trades department in the Frank Wiggins Trade School in Los Angeles.



Ruskin hydro plant of B. C. Electric Power Corp. Installed capacity, 47,000 hp.; ultimate capacity, 188,000 hp. Situated 35 miles from Vancouver on picturesque Stave River, easily accessible by road

The A.I.E.E. Convention at Vancouver

Its Program, Its Officers, Its Points of Interest

IN less than a month—from Aug. 30 to Sept. 2, to be exact—electrical engineers from the western portions of the United States and Canada will gather at Vancouver, B. C., for the annual Pacific Coast convention of the A.I.E.E. Hotel Vancouver will be the official convention headquarters and all sessions will be held there.

Following the accepted procedure, the technical sessions will be divided into four parts: Power generation; transportation; electrical machinery and metering; and transmission, communication and station apparatus. The fourteen papers which will be presented at these sessions offer a variety of subject matter and include up-to-date theory and practice in the electrical engineering profession.

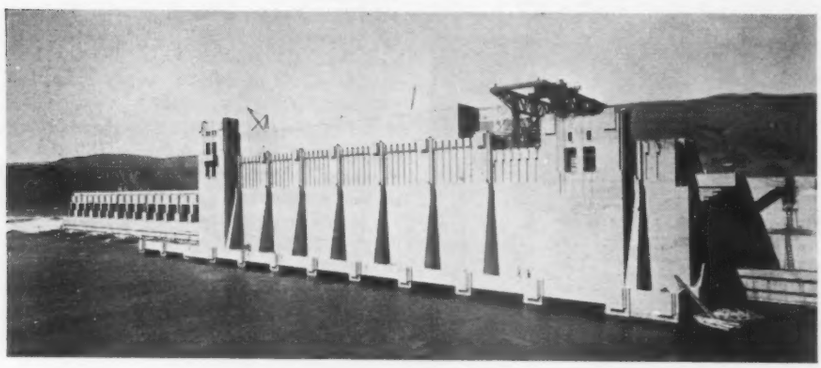
Entertainment is offered in variety. The president's reception, to be followed by dancing, will be held on the evening of the opening day. A 4-hour cruise has been arranged for Wednesday, Aug. 31, to give delegates an opportunity to see the scenery of Vancouver harbor and its background of mountains. Dinner and dancing will be provided on the boat.

Following the annual golf tournament on Thursday afternoon at the Shaughnessy Heights Golf Club will be a banquet, with the presentation of golf prizes and incidental entertainment as high spots. On Friday afternoon, Sept. 2, motor trips will be made to points of interest in the area surrounding Vancouver.

Delegates will purchase banquet and entertainment tickets at the time of registration. These tickets provide admission to the president's reception, the boat trip and dinner on Aug. 31, the annual banquet and, in the case of the ladies, the bridge tea. For A.I.E.E. members and male guests the fee is $7.50, for ladies $6, and for students $2.50.

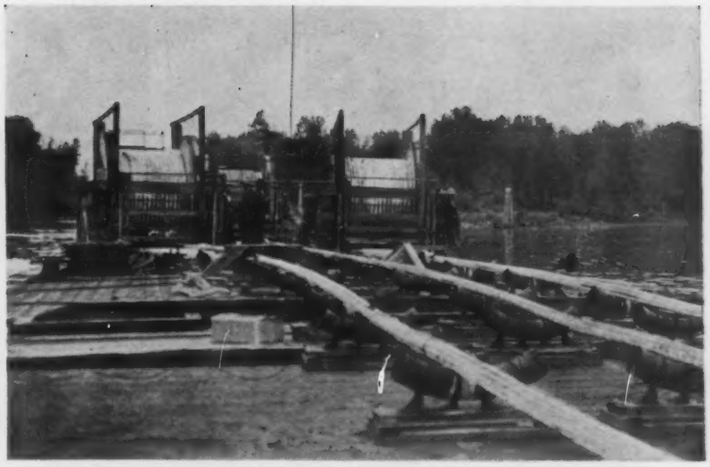
Special attention has been given to the student program, which includes two student sessions, a conference, and a dinner at Union College, University of British Columbia. The Terminal City

Rock Island hydro plant of Puget Sound Power & Light Co. on the Columbia River near Wenatchee, Wash. Designed for an ultimate capacity of 150,000 kw. at a maximum head of 48 ft.



Club, 837 West Hastings St., Vancouver, will accommodate student delegates for $1 a day. Tickets for individual functions will be sold only to students.

This year's program is said to be one of the finest ever attempted for the Pacific Coast convention. Under the general chairman, G. R. Wright, Canadian General Electric Co., convention committees have made available every facility for the comfort and entertainment of those who attend the meetings. The formal program follows:



Cable installation of Northwestern Electric Co., near Vancouver, Wash., will carry power under the Columbia River at 115 kv. These cables are the first to be used for submarine transmission at this voltage

GENERAL CONVENTION PROGRAM

Tuesday, Aug. 30

9:30 a. m. Registration.

10:00 a. m. Opening of the convention by President H. P. Charlesworth.

10:30 a. m. Technical session on power generation.

"The Power System of The British Columbia Power Corporation, Ltd.", by E. E. Carpenter, British Columbia Electric Railway Co.

"Rock Island Development of The Puget Sound Power and Light Co.", by A. P. Newberry, Puget Sound Power and Light Co.

"Segregation of Hydro-electric Power Costs", by W. S. McCrea, Jr., Dept. of Public Works, State of Washington.

Noon Luncheon, students and counsellors. E. G. Cullwick, chairman.

2:00 p. m. Technical session on Transportation, electric machinery and metering.

"Reading Co.'s Philadelphia Suburban Electrification", by G. I. Wright, Reading Co.

"Electrical Operation on the Cascade Division of the Great Northern Railway", by J. B. Cox, General Electric Co.

"Theory of Three-Wire D.C. Generator with Two-Phase Static Balancer", by Prof. E. G. Cullwick, University of B. C.

"Metering of Symmetrical Components", by G. R. Shuck, University of Washington.

8:00 p. m. President's reception, followed by dancing.

Wednesday, August 31

8:00 a. m. First student session.

Noon Luncheon for district and section executives and student counsellors. H. V. Carpenter, chairman.

2:00 p. m. Second student session.

5:30 p. m. Boat trip around Vancouver harbor. Dinner and dancing on board.

Thursday, Sept. 1

9:00 a. m. Technical session on station apparatus.

"Shaping of Magnetization Curves and Theory of the Zero Error Current Transformer", by A. C. Schwager, Pacific Electric Mfg. Corp.

"The Constant Permeability Current Transformer", by V. A. Trent, Pacific Electric Mfg. Corp.

"Factory Assemblies for Substation Design", by H. M. Hobbs, Westinghouse Electric and Mfg. Co.

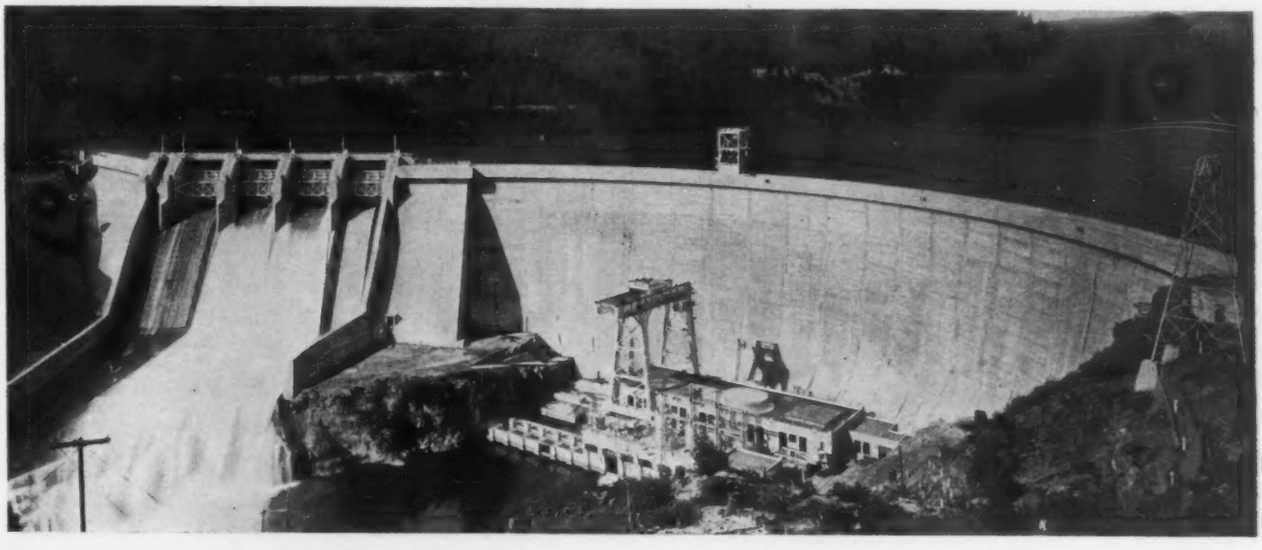
"Operating Experience With High Voltage Circuit Breakers", by R. E. Rowley, Dept. of Water and Power, City of Los Angeles.

2:00 p. m. Golf tournament at Shaugnessy Heights Golf Club. B. De M. Mertens, chairman. Ladies' outing.

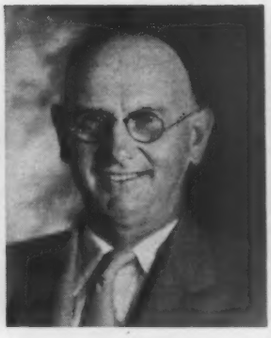
7:30 p. m. Banquet, followed by the presentation of golf prizes and entertainment. G. R. Wright, chairman.

Alberta Pool elevator No. 1 at Vancouver, B. C., is the largest tide water grain elevator in the world and has many interesting electrical applications in its material handling system

Ariel hydro plant of Northwestern Electric Co. is located 28 miles from Vancouver, Wash. Installed capacity, 45,000 kw. in one unit; ultimate capacity, four units of this rating



A. F. DARLAND
Seattle



F. E. DELLINGER
Los Angeles

C. F. NORBERG
Spokane

Friday, Sept. 2

9:00 a. m.	Technical session on power transmission and communication.
	"Corona Loss Measurements for the Design of Transmission Lines to Operate at Voltages Between 220-Kv. and 330-Kv.", by J. S. Carroll, Stanford University, and B. Cozzens, Dept. of Water and Power, City of Los Angeles.
	"The Triple Harmonic in 3-Phase Power Systems", by T. H. Morgan, Worcester Polytechnic Institute, and C. A. Bairos and G. S. Kimball, Stanford University.
	"The Radio Plant of the R.C.A. Communications, Inc.", by H. H. Beverage, C. W. Hansell and H. O. Peterson, R.C.A. Communications, Inc.
	"Radio Links in the System of the British Columbia Telephone Co.", by C. H. McLean, British Columbia Telephone Co.
Noon	Luncheon under the auspices of the Vancouver Electric Club.
2:00 p. m.	Inspection trips. C. W. Colvin, Chairman.
	Ladies' bridge tea.
6:45 p. m.	Dinner at Union College, Univ. of B. C., for those attending the student conference.

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Pacific Coast Sections Install Officers

COINCIDENT with the opening of the current administrative year of the A.I.E.E., on Aug. 1, seven new chairmen of Pacific Coast sections took office and one, G. R. Wright, was re-inaugurated. Officers and executive committee members of the sections are:

San Francisco Section: Chairman, E. F. Maryatt, Pacific Gas and Electric Co.; vice-chairman, W. C. Smith, General Electric Co.; secretary-treasurer, Roy Wilkins, Pacific Electric Mfg. Corp. Executive committee: E. M. Wright, Pacific Gas and Electric Co.; F. E. Terman, Stanford University; L. J. Moore, San Joaquin Light & Power Corp.; and A. M. Bohnert, Ohio Brass Co.

Los Angeles Section: Chairman, F. E. Dellinger, Los Angeles Gas and Electric Corp.; secretary, A. P. Hill, Pacific Telephone & Telegraph Co.; assistant secretary, Fred Garrison, General Electric Co. Executive committee: W. F. Grimes, Westinghouse Electric & Mfg. Co.; R. H. Halpenny, The Southern Sierras Power Corp.; O. W. Holden, Los Angeles Bureau of Power & Light; and S. S. MacKeown, California Institute of Technology.

Seattle Section: Chairman, A. F. Darland, Tacoma Light Dept.; vice-chairman, Prof. G. L. Hoard, University of Washington; secretary-treasurer, K. L. Howe, Westinghouse Electric & Mfg. Co. Executive committee: C. B. Carpenter, Pacific Telephone & Telegraph Co.; M. T. Crawford, Puget Sound Power & Light Co.; C. E. Carey, Westinghouse Electric & Mfg. Co.; and C. R. Wallis, General Electric Co.

Portland Section: Chairman, F. M. Lewis, Northwestern Electric Co.; secretary-treasurer, V. B. Wilfley, Westinghouse Electric & Mfg. Co. Executive committee: L. A. Morphey, Northwestern Electric Co.; C. C. Boozier, Westinghouse Electric & Mfg. Co.; E. C. Curtis, General Electric Co.; and Walter Brenton, Portland General Electric Co.

Spokane Section: Chairman, C. F. Norberg, Washington Water Power Co.; vice-chairman, W. M. Allen, Home Telephone & Telegraph Co.; secretary-treasurer, H. L. Tinling, Tinling and Powell. Executive committee: H. L. Vincent, General Electric Co.; L. R. Gamble, The Washington Water Power Co.; J. R. Murphy, General Electric Co.; and J. S. McNair, The Washington Water Power Co.

Denver Section: Chairman, W. D. Hardaway, Public Service Co. of Colorado; vice-chairman, A. W. Ainsworth, William Ainsworth & Sons; secretary-treasurer, N. R. Love, Denver Tramway Corp. Executive committee: Dr. R. E. Nyswander, Denver University; L. N. McClellan, U. S. Bureau of Reclamation; and R. B. Bonney, Mountain States Telephone & Telegraph Co.

Utah Section: Chairman, A. LeRoy Taylor, University of Utah; secretary-treasurer, E. L. Morris, Westinghouse Electric & Mfg. Co.; representative on engineering council, L. B. Fuller, Utah Power & Light Co. Executive committee: W. R. Barrett, Utah Power & Light Co.; M. E. Callahan, Jr., General Electric Co.; J. H. Hamilton, University of Utah; C. A. Malinowski, Utah-Idaho-Central Railway Co.; and Paul Ransom, Utah Apex Mining Co.

Vancouver Section: Chairman, G. R. Wright, Canadian General Electric Co.; vice-chairman, L. B. Stacey, Packard Electric Co.; secretary, D. M. Johnstone, B. C. Electric Railway Co., Ltd. Executive committee: J. E. Underhill and C. Arnott, both B. C. Electric Railway Co., Ltd.

C. R. HIGSON
National Officer

G. R. WRIGHT
Vancouver

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C. R. Higson, Utah Power & Light Co., was elected a vice-president of the national association at its summer convention in Cleveland. A. W. Copley, Westinghouse Electric & Mfg. Co., San Francisco, vice-president last year, again is a member of the national board of directors.

F. M. LEWIS
Portland

W. D. HARDAWAY
Denver

A. LEROY TAYLOR
Utah

Manufacturer Distributor

Hubbard Gets Ohio Brass Hardware Lines

Ohio Brass Company, Mansfield, Ohio, announces that it has disposed of its line of wood cross-arm hardware, wood guy-strain insulators and steel insulator pins to Hubbard and Co., Pittsburgh, Pa. The latter company is licensed to manufacture and sell pole line hardware developed by Ohio Brass and protected by its patents. This is a manufacturing and sales arrangement only, and there is no financial interest of either company in the other. These materials, in the future, will be manufactured only by Hubbard, although both companies will cooperate in the sale of the devices. Future development work on this class of materials also will be carried forward by both companies.

▼

Electrotrim Given Interim Approval

Electrotrim, a material for surface extensions to electric wiring in residential premises, has received an interim approval for inclusion in the National Electrical Code, as a result of a letter ballot to the membership of the Electrical Committee of the N.F.P.A., according to A. R. Small, chairman. The revisions were made to Article 5, Section 516, and will be numbered 516a to 516h, inclusive. Particular requirements under the rulings are: Use in dry locations in residence and office occupancies; attachment to existing convenience outlets; not to be used concealed or run through floors or partitions or where subject to moisture or corrosive vapors; no installations on circuits of over 150 volts to ground; shall not run more than 20 ft. in either direction of existing outlet; may contain a maximum of three receptacles, provided the total outlets on the branch circuit, including those on the extension, are not more than 12.

The material is a flat assembly of two rubber-covered wires separated by about three-quarters of an inch of nonconducting material and covered by a stitched fold of pantasote or other imitation leather. It is installed along baseboards or on walls by tacking through the covering fabric between the two wires, the tacks being concealed by an overhanging flap. It is made up in various colors to match room trim and its fittings are made of Bakelite. A special tool has been developed for cutting the insulation at points where outlets are to be placed.

▼

HOFFMAN Specialty Co. of California, Ltd., has announced the appointment of Chamblin-Thomas Co., San Francisco, as its central station representative in northern California on the Hoffman company's full line of Thermador heaters and Watchman thermostats.

Standard, Servel and Curtiss

Left to right—Harry Eckenroth, sales manager, H. R. Curtiss Co., San Francisco; H. R. Curtiss; William P. Swartz, Pacific Coast manager, Standard Electric Stove Co.; C. C. Smoot, special representative, Standard Electric Stove Co.; and W. T. Wyatt, Western factory representative, Servel Sales, Inc. H. R. Curtiss Co. is the northern California distributor for Standard ranges and Servel refrigerators

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THOR PACIFIC CO., distributors of Thor washers, with offices in San Francisco and Los Angeles, has been purchased by the Hurley Machine Co., according to R. G. Chamberlain, vice-president in charge of Pacific Coast operations. E. O. Thomas, former president of Thor Pacific, has been appointed assistant to the president of Hurley Machine Co., with offices in Chicago. John Gunderson is Los Angeles manager and W. S. Frazier is San Francisco manager of Thor Pacific.

INCANDESCENT Supply Co., San Francisco and Los Angeles, has become distributor for Jewett refrigerators, Delco vacuum cleaners, Diehl fans, Polar Cub fans, Hammond clocks and Dominion Electric products, in addition to the lines of fixtures and wiring supplies which the company has handled for years. M. H. Jankleson is manager of the San Francisco office and B. Jankleson heads the Los Angeles branch.

▼

Quotas Broken in Maytag Contest

Selling 137 per cent of its quota of Maytag washers, the Spokane district of Maytag Intermountain Co. won second place in a two months' sales contest conducted in nine Western states. The Oregon district, with 144 per cent, was first.

"Business cannot be so bad here," said Leo Airhart, manager of the Spokane branch, "when we sold 73 washers in June and 67 in May, against a 44 quota for each month."

The 33 regular salesmen of the organization were guests at a victory banquet on July 30.

Changes of Address

H. H. BENFIELD, San Francisco, Steel & Tubes, Inc., representative, moved to 718 Rialto Bldg.

CENTURY ELECTRIC Co., Seattle, has combined Seattle and Portland offices into one at 1518 First Ave., Seattle

LOMBARD SMITH Co., Los Angeles, manufacturers' representative, moved to 1224 Wall St.

KENNETH ANDERSON, Los Angeles, Steel & Tubes, Inc., representative, moved to Edison Bldg.

FRIGIDAIRE SALES Co., Los Angeles, moved to 1027 No. Highland, Hollywood.

SANTA ANA ELECTRIC Co., Santa Ana, Calif., moved to 405 No. Birch St.

DETRICK-JOSLYN Co., Los Angeles, manufacturers' representative, changed name to Joslyn Co. of California.

E. M. PEAKE, formerly manager of the Los Angeles office, The Union Metal Co., has been made general sales manager of the company, with offices at Canton, Ohio.

Market Review

California and Intermountain—

THOUGH vacations of soliciting salesmen, which were set officially for mid-July, and such public events as the Olympic Games in Los Angeles and the Shrine convention in San Francisco temporarily will reduce sales in various lines, still it is a fact that the business atmosphere is noticeably more hopeful, particularly because the volume has run

on an even keel for several months.

Encouraging as a sales barometer was the recent Pacific Gas and Electric Co. campaign on ranges and water heaters, which resulted in over-quota sales of 1,622 ranges and 961 heaters. (See NEWS.) The effort to replace oil, coal and wood installations will be continued for another 90 days, so good was the showing.

Recent building permits show approximate decreases of 65 per cent for the bay area (San, Francisco, Oakland, et al) and 75 per cent for Los Angeles. However, San Francisco permits for June, for example, show a decrease of only 25 per cent over last year.

Among larger orders placed in July were 5,000 lb. of tape for Los Angeles; 120,000 ft. of 3½- and 4-in. fiber conduit for Hawaiian Islands; three 1,000-kva., 44,000-volt substation transformers for Hawaiian Islands; $2,500 in control equipment for stage lifting machinery in San Francisco Civic Center buildings; 129 floodlights and miscellaneous oil switches and controls for a golf course installation; six 200- to 800-hp. motors, value $18,000, for a City of Denver installation, but delivered to a bay area firm for incorporation into pumping equipment.

Other pumping business, particularly the staple sizes, is disappointing because of such factors as abundant water on one hand and purchasing inability on the other. This business, which usually begins in March and holds up until August, is conspicuous by its absence this year and has kept down the curve of machinery sales.

Fans, too, despite a recent order for $6,000 miscellaneous Westinghouse types for a Pacific fleet, have been moving slowly because of consumer lack of interest, and many dealers find themselves with much of their modest stock orders on hand. Here again a natural condition, namely, a late summer, has contributed somewhat, but the real answer is forced consumer economy.

Forthcoming installations include the University of California hospital, value $800,000; several postoffices in the Reno and Santa Rosa areas, all of which are being figured now; the Fort Miley hospital, value $1,500,000; and the federal office building, in San Francisco, value $3,500,000, for which plans are still in preparation.

Lighting installations have been greatly stimulated by sport, with the Olympic swimming equipment in Los Angeles and various dog racing tracks in the bay area as outstanding.

School maintenance and new construction, usually brisk during summer vacation time, is limited to a few small jobs this year, most school budgets being under fire.

Prices are steadier in most staple lines, with increases in certain wiring materials, flexible metallic conduit and cord.

Pacific Northwest—

ALTHOUGH sales of apparatus, switchgear, motors, meters, transformers and domestic appliances showed a slight decrease over June, the majority of Seattle jobbers agree that bottom has been reached and that the firming up process has been started. Fair business for the fall months, they say, is well assured.

Central station buying was light, principally of 5- to 50-kw. distribution transformers and 5- to 50-amp. meters. Seattle's City Light bought 40,000 lbs. of No. 4, weatherproof, soft drawn, solid copper conductor and 20,000 plug fuses (15 to 30 amp.), and the U. S. Treasury department issued a call for bids on $10,000 worth of transformers, primary service cable, conduit and secondary service connections for the marine hospital in Seattle. Bids will be opened by the supervising architect on Aug. 17. Jobbers and dealers in Puget Sound area report movement of schedule materials, radio and domestic appliances very light.

Approximately $700,000 worth of projected buildings were announced in Seattle, including an 8-story medical-dental building, a downtown office structure and a small hospital. Residence construction is marking time. Lumber mills reporting to West Coast Lumbermen's Assn. are operating at 20-25 per cent capacity, with prices at bedrock.

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Barometer

INDUSTRIAL activity in June receded from the preceding month's levels, as is usual in summer, but the decrease in the West was only 3 per cent, compared with 10 per cent in 1931. Electrical energy consumption figures in industrial plants indicate a rate of operations 16 per cent below that a year ago. Declines in the West are smaller than in the nation as a whole.

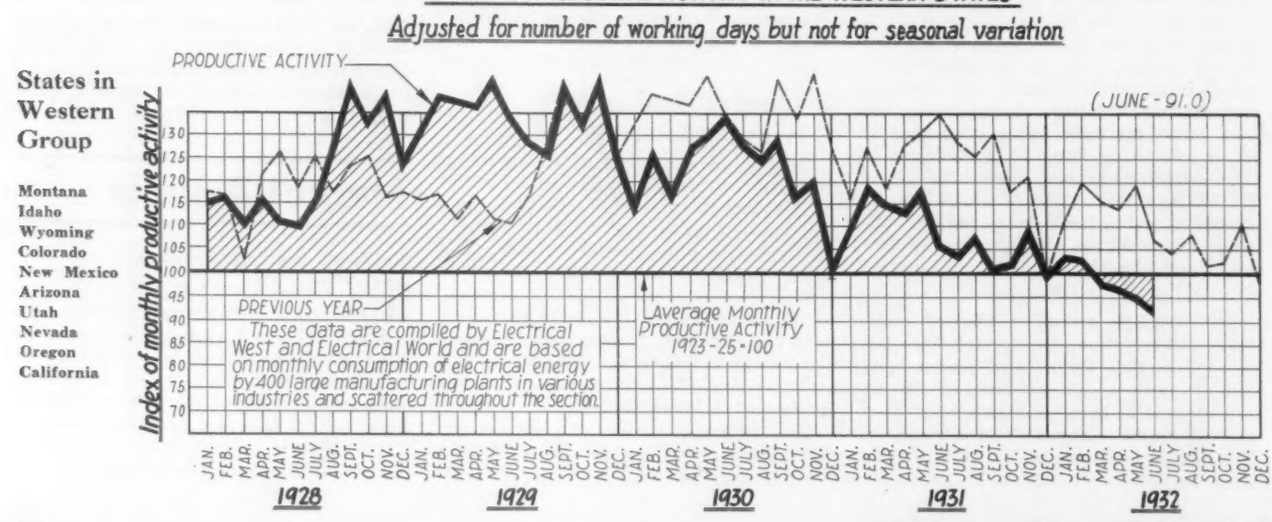
Rubber is up 30 per cent in the West, 25 per cent in the United States. Metals and shipbuilding also show increases.

Indexes of Manufacturing Activity in the Western States

(All figures adjusted for number of working days)

	June, 1932	May, 1932	April, 1932	June, 1931
All industry	91.0	94.3*	96.2	108.0
Chemicals	85.5	90.1*	82.7	78.0
Food	112.8	115.3*	114.8	135.4
Forest products	105.6	117.0	128.0	139.0
Metals group	41.7	36.2*	38.0	60.8
Paper and pulp	128.7	143.0*	134.0	131.0
Rubber	132.0	100.7*	99.0	151.9
Shipbuilding	105.0	102.5*	100.7	80.5
Stone, clay and glass	72.8	79.1*	96.6	85.8

* Revision.



New Products

Food Preparer

Domestic Maid Sales Division, Widener Bldg., Philadelphia, is introducing a new food preparer which beats, whips, stirs, slices, mixes dough, shreds, grates and extracts juices. Operated by 1/10-hp. motor; height 16 in.; weight 17 lb. List price, including eight attachments, $32.50.—Electrical West, Aug. 1, 1932.

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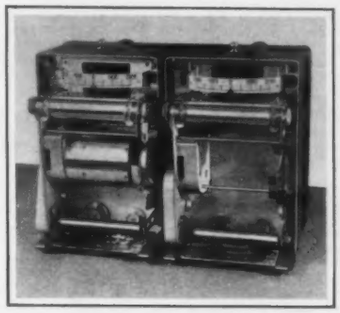
Graphic Instruments



Esterline-Angus Co., Indianapolis, has announced a new line of graphic recording instruments in which spring clocks, which drive the charts, are made of removable units. These interchangeable clock units can be dropped out and replaced in the field, without service interruption. All three clock springs are wound at once by a crank. Electrical synchronous clocks also are available for driving the charts. The instruments are made in portable, switchboard flush, switchboard front and wall type cases.—Electrical West, Aug. 1, 1932.

Air Conditioner

An electric air conditioner which requires no installation nor fittings and which plugs into any convenient wall receptacle or light socket (a.c. or d.c.) is a product of the Clement Mfg. Co., Chicago. The unit is portable, occupies a floor space of 18x15 in., and automatically operates when the condition of the air warrants. Delivers over 9,000 cu. ft. of conditioned air per hour. Intended retail price, $165.—Electrical West, Aug. 1, 1932.

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New Model Magic Maid

A new model Magic Maid mixer is offered by Fitzgerald Mfg. Co., Torrington, Conn., with improved features over past models. For instance, motor tilts to three positions, juice extractor unit has been simplified. Retail price west of Rockies, $19.95.—Electrical West, Aug. 1, 1932.

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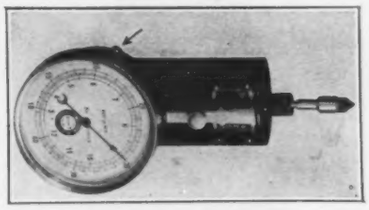
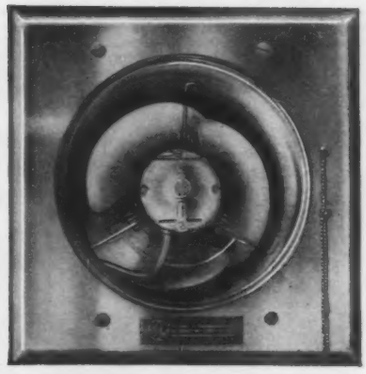
Hand Tachometer



Amthor Testing Instrument Co., Inc., Brooklyn, N. Y., has developed a type No. 350 direct-reading tachometer for reading any speed to 12,000 r.p.m. With this instrument, the speed reading automatically is fixed on the dial after each test, obviating errors from hasty reading or faulty memory. Because of this feature, it can be used in otherwise inaccessible places.—Electrical West, Aug. 1, 1932.



Wall-Ventilating Fan

A wider blade, with changed shape and pitch, is incorporated in a new ventilating fan brought out by General Electric Co., Bridgeport, Conn. This feature is claimed to promote more quiet operation. Interior parts are cadmium treated to prevent corrosion; blade is of polished aluminum. Outside wall plate is finished in green enamel and shutters are of brush-finished stainless steel. Available for 110 volt, 60 cycle operation. Price, $35.—Electrical West, Aug. 1, 1932.

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Neon Sign Flasher

The Reco Neonimator, manufactured by Reynolds Electric Co., Chicago, is a flasher for neon signs. It can be used for spellers, traveling borders, alternate signs and colors, revolving wheels, etc. The motor is of shaded pole, induction disk design. Contacting mechanism is enclosed in porcelain housing. Flashing speed ranges from 15 to 200 times per minute. List price, $19. Discount 40 per cent, f.o.b. Chicago.—Electrical West, Aug. 1, 1932.

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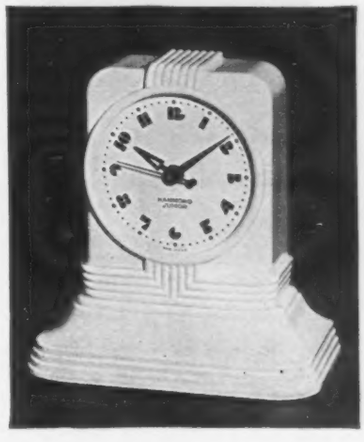
"Timesaver"

Refrigeration salesmen will find use for the "Timesaver", a new kitchen model clock brought out by Hammond Clock Co., because a savings-



bank base provides for daily contributions toward the cost of the refrigerator. It may also be used in merchandising other appliances, for the clock is independent of the appliance. Also furnished in walnut bakelite case, if the white case illustrated in not desired.—Electrical West, Aug. 1, 1932.

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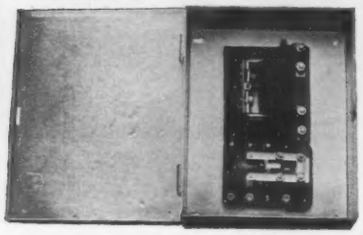
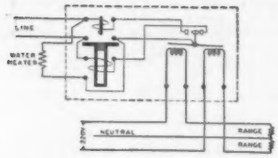
Peak Limiter



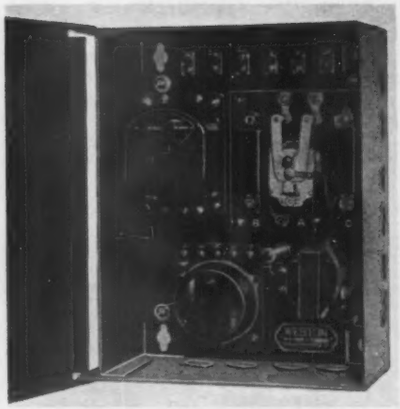


Of interest to utilities and range and water heater dealers is the new Dunco peak limiter, recently introduced by Struthers Dunn Inc., Philadelphia, to automatically limit the maximum load demand with preference to the immediately essential appliance. The device is mounted in an aluminum-finished box, 8½ x 10 x 4 in. Type RPX 136, to operate at 25 per cent or more of maximum load, sells for $19. Type RPX 137, to operate at 12 to 25 per cent of maximum load, $22.—Electrical West, Aug. 1, 1932.

▼

Samson Sun Lamp

Although it stands 67 in. high, this No. 139 floor model sunlamp, manufactured by Samson-United Corp., Rochester, N. Y., weighs but 17 lbs. Finished in statuary bronze, with an 11-in. diameter reflector. It is rated 100 watts, 110-220 volts, 50 or 60 cycles, a.c. only. Complete with bulb and 8-ft. cord, list price, $19.50.—Electrical West, Aug. 1, 1932.



Photronic Relays

Two new photronic relays, Model No. 609, shown, and Model No. 612, have been introduced by Weston Electrical Instrument Corp., Newark, N. J. The former model is for illumination control and will control circuits up to 3,000 watts at 110 volts. Model No. 612 is for industrial control, such as counting, sorting, alarms, matching colors and similar uses. See Trade Literature note.—Electrical West, Aug. 1, 1932.

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"Heatproof" Connector Plug

New Connector Plug with Outside Springs

A new "Heatproof" connector plug with contact pressure springs on the outside of the case has been produced by Cutler-Hammer, Inc., Milwaukee. The outside springs hold the halves together, eliminating screws and nuts. Plug body made of Thermoplax.—Electrical West, Aug. 1, 1932.

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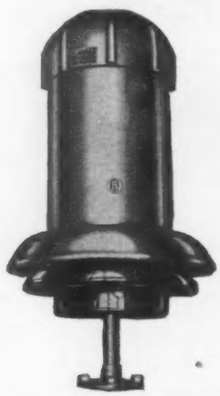
Dry Coupling Condenser



Ohio Brass Co., Mansfield, Ohio, in conjunction with Western Electric Co., has developed a unit type, dry coupling condenser consisting of a large porcelain tube with one closed end and with ordinary petticoats at the other. These petticoats provide the leakage path between inner and outer metalized surfaces. See O-B bulletin No. 601-H.—Electrical West, Aug. 1, 1932.

Trade Literature

¶ STAINLESS STEEL MOTOR—The Lincoln Electric Co., Cleveland, has issued a pamphlet describing its Type E motor, with a table of dimensions for all sizes of the unit.

¶ UNIT TYPE DESIGNATORS — Delta-Star Electric Co., Chicago, has issued price list No. 63, covering unit type designators. These designators are for use in making signs for operating handles of gang-operated switches, designating circuits, for cell identification, oil switch and transformer numbering, etc.

¶ COUPLING CONDENSERS—Bulletin 601-H of Ohio Brass Co., Mansfield, Ohio, now available, contains 22 pages on the application, use and characteristics of the unit type coupling condenser unit for obtaining instrument potentials from high-voltage circuits.

¶ TAPE—B. F. Goodrich Co., Akron, Ohio, is mailing a new pamphlet on its combination rubber tape and friction tape to all contractors who request it.

¶ MAGNETIC CLUTCHES—A 16-page bulletin on the installation and use of magnetic clutches for special and general power transmission applications has been prepared by Dings Magnetic Separator Co., Milwaukee. The book describes the Dings single-, multiple-, and sorrated- disk clutches, includes tables of performance data, horsepower rating calculations and installation diagrams.

¶ INDUCTION MOTORS—Reliance Electric & Engineering Co., Cleveland, is issuing bulletin No. 112, on its fully-enclosed, fan-cooled induction motors. Diagrams and pictures are used in describing the units.

¶ COPPER WIRE AND COILS—Complete data sheets on copper wire and coils, arranged in loose-leaf binders so that subsequent pages may be added, are being distributed by Inca Mfg. Division, Phelps-Dodge Copper Products Corp., Fort Wayne, Ind. The edition is limited.

¶ RELAYS—General Electric bulletin No. GEA-1583 describes the company's line of high speed, directional distance, directional overcurrent and time induction relays.

¶ WESTINGHOUSE BULLETINS—No. C.1948 describes the operation and construction of the new Polaricode split-second supervisory control. An 8-page bulletin with pictures, charts and diagrams.

Bulletin No. C.1944 covers new applications of economical secondary low-voltage networks to low-density load areas fed by overhead wires. This circular tells where the network applies and contains a description of two new types of protectors.

¶ HOME LIGHTING—General Electric's Incandescent Lamp Dept., at Nela Park, Cleveland, has issued a 16-page booklet in two colors titled, "How to Light Your Home." It carries a foreword by Emily Post and features typical home scenes in which good lighting plays a vital part. Accompanying each photographic illustration are sketches showing the types of fixtures best suited to the lighting requirements.

¶ PHOTRONIC RELAYS—Weston Electrical Instrument Corp., Newark, N. J., has issued circular No. E-1 to describe the two new photronic relays developed by the company. The booklet shows the application, advantages and gives a detailed description of both models, with pictures and diagrams. Another booklet describes experiments that may be conducted with the instruments, offering a prize for each new amateur experiment which can be performed with the two models.

¶ ELECTRIC CHIMES—A new pamphlet has been prepared by Diamond Electrical Mfg. Co., Los Angeles, on the complete Diamond E electric chime line.

¶ HEATER-COOLER—B. F. Sturtevant Co., Boston, has released catalog No. 390 on the new speed heater-cooler. Catalog contains operation data and cooling capacity tables on various sizes of units.

¶ RANGES—"Six Simple Steps on How to Sell More Ranges" is a new booklet by Edwin L. Weigand Co., Pittsburgh, describing and illustrating the advisability of selling faster units in old ranges to insure customer satisfaction, so that future range selling will be easier.

Standard Electric Stove Co., Toledo, Ohio, has prepared an illustrated booklet, "The Advantages of Electric Cookery", for dealer-consumer distribution.

FOR THE

SOUTHERN CALIFORNIA GAS COMPANY

In compliance with the provisions of the mortgage, the Southern California Gas Company had an examination made and a report furnished covering the fixed utility properties of the company. The purpose was to ascertain if these properties were being adequately maintained.

In selecting us for this work, our experience in this and similar types of work was an important consideration.

Making reports and appraisals has been a regular part of our business for 40 years.

STONE & WEBSTER
ENGINEERING CORPORATION

A SUBSIDIARY of STONE & WEBSTER, INCORPORATED

SEATTLE	SAN FRANCISCO	LOS ANGELES
Skinner Building	Russ Building	Edison Building

Air Conditioning . .

OUR NEXT BIG FIELD

Progress already made in the marketing of air conditioning equipment indicates how great a demand exists for this comfort-yielding device.

For ages, man has sought comfort in hot weather—a definite *want*. Now manufacturers are producing satisfactory apparatus for controlling temperature and humidity.

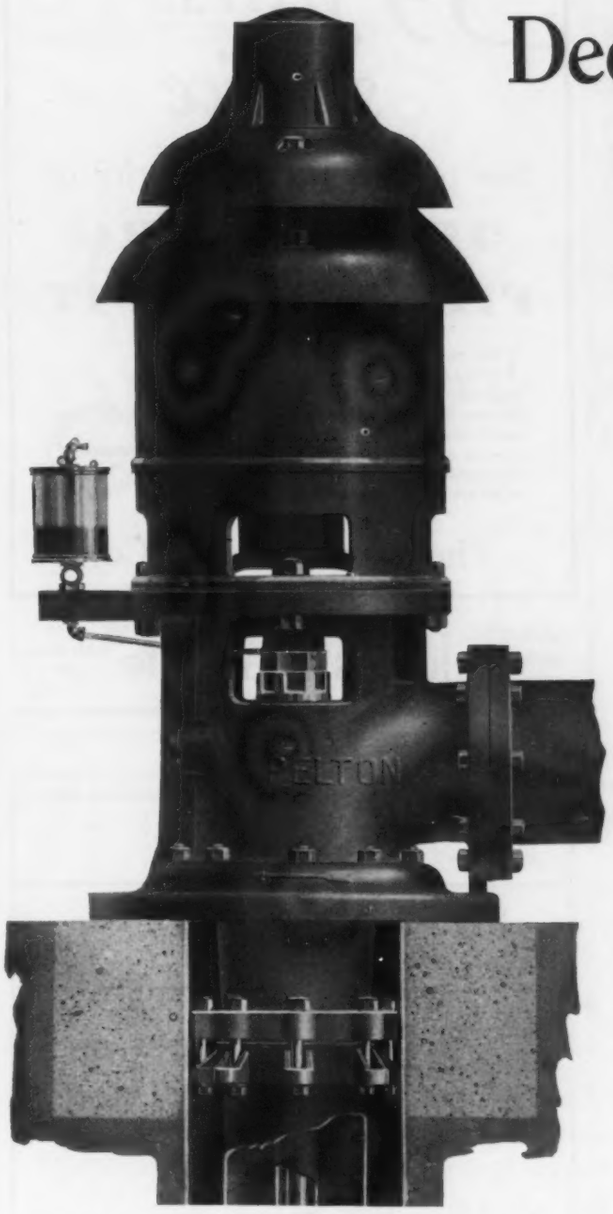
It remains for the electrical industry to act as the intermediary so that the manufacturer and the consumer may be brought together. We will act as the mutual friend who introduces two men who ought to know each other.

Every day, thousands of men in the electrical industry of California visit places that need air conditioning—hotels, cafes, barber shops, doctors' and dentists' offices, stores of all sorts. Let's keep air conditioning in mind and when we go into one of these places, *as a customer,* we can say, "By the way, I want you to meet a friend of mine".

SOUTHERN CALIFORNIA Edison

Southern California Edison Company Ltd.

PELTON



Deep Well Turbines
for Utilities, Industry

The deep well pump has reached its high state of development within a comparatively few years. First conceived as an asset for the irrigationist removed from gravity canals, it has now demonstrated its efficiency in practically any area where deep well water is available.

The same high standards of design and workmanship that have characterized Pelton hydraulic turbines assure the utmost dependability and efficiency of Pelton Type T pumps. They are furnished in a wide range of capacities, each unit being engineered to the specific well conditions in which it is to be installed. Bulletin No. 22-A gives complete descriptions of all parts. The services of Pelton engineers are readily available without obligation.

These Pelton Features Are Important to Reduced Water Costs

IMPELLERS of the mixed flow type do not require close running clearances to attain high efficiency. Sand wear, therefore, cannot impair efficiency.

Bronze bearings of extra length are used throughout; sight feed lubrication in the column sections, grease packing below the water line, with full protection against sand.

Stainless steel shafting throughout bowl section.

Patented shaft couplings positively prevent uncoupling upon reverse rotation.

All column sections are interchangeable, facilitating installation and additions, if required.

THE PELTON WATER WHEEL COMPANY

HYDRAULIC ENGINEERS

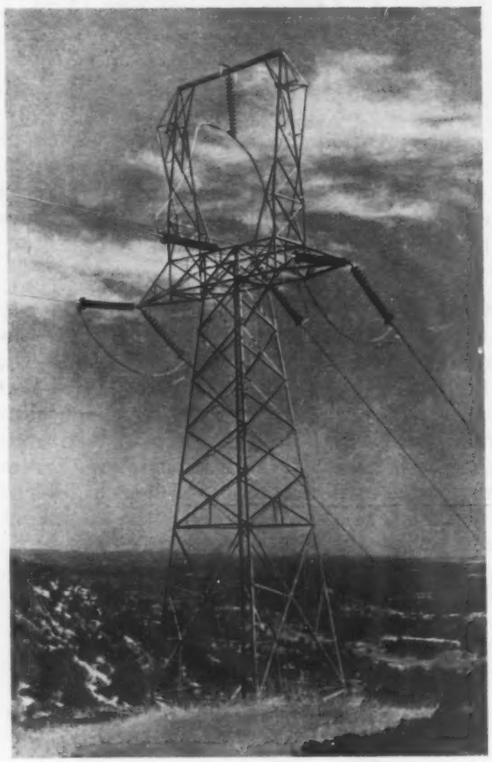
120 Broadway	2929 Nineteenth St.	Paschall Station
NEW YORK	SAN FRANCISCO	PHILADELPHIA

Pacific Coast Representatives for BALDWIN-SOUTHWARK CORPORATION, DELAVERGNE ENGINE CO., and LARNER ENGINEERING CO., of Philadelphia, Pa.

PELTON

TRANSMISSION STRUCTURES

that are dependable



220 Kv. Transmission Tower, Great Western Power Company's Line, Big Bend to Brighton

Extensive steel-making experience is an important factor in the ability of Pacific Coast Steel Corporation to meet the requirements of power companies for dependable transmission structures.

The grade of steel used in the manufacture of Pacific Coast Steel Transmission Structures has been developed especially for the purpose. It is highly elastic, with a guaranteed minimum yield point of 45,000 lb. per sq. in., and 22 per cent elongation in 8 in.; it withstands a flat bend without fracture.

The use of this special steel, together with long experience in the design and manufacture of Transmission Structures, insures a thoroughly dependable product.

PACIFIC COAST STEEL CORPORATION

Subsidiary of BETHLEHEM STEEL *Steel Corporation*

General Offices: San Francisco
District Offices: Seattle, Portland, Los Angeles, Honolulu
Export Distributor: Bethlehem Steel Export Corporation
25 Broadway, New York City

PACIFIC COAST STEEL CORPORATION

39 *years' service*

has proved the superiority of

ORANGEBURG FIBRE CONDUIT

THE thousands of miles of Orangeburg Fibre Conduit in use today vouch for its dependability in protecting underground circuits. Supplied in uniform lengths, it is easy to install, costs little to handle. Stocks carried at the manufacturing plants in Orangeburg, N. Y.; Richmond, Ind., and in all larger cities insure prompt shipments.

The Fibre Conduit Co.
ORANGEBURG, N. Y.

SOLE SELLING AGENT Johns-Manville 292 Madison Ave., N. Y.C.

Dry Type

Air Cooled

500 watt
Single Phase
Unit

ALWAYS DEPENDABLE

Standard Sizes—50 watt to 5 kva. 440-220-110 volts

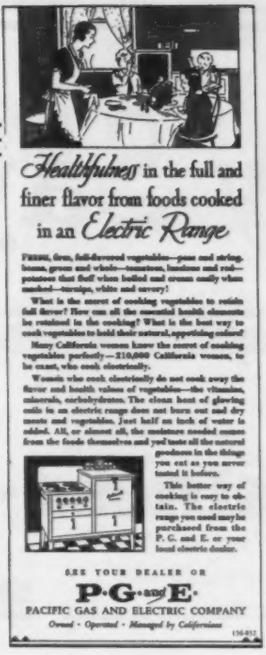
Intelligent, Individual Service on Special TRANSFORMERS

JEFFRIES TRANSFORMER CO.
5706 Long Beach Avenue -:- Los Angeles, Calif.
In San Francisco Area
Electric Agencies, 2059 Webster St., Oakland, Calif.

Electric Range

DEALERS

(IN RURAL COMMUNITIES)


Healthfulness in the full and finer flavor from foods cooked in an Electric Range
SEE YOUR DEALER OR
P·G·and E·
PACIFIC GAS AND ELECTRIC COMPANY
Owned · Operated · Managed by Californians

COOKING by the clock....
COOKING by accurate temperatures
..these the Electric Range gives women today
SEE YOUR DEALER OR THE
P·G·and E·
PACIFIC GAS AND ELECTRIC COMPANY
Owned · Operated · Managed by Californians

To Benefit by this Advertising

THESE two advertisements are to appear during August in seventy-eight newspapers in towns and cities in which Pacific Gas and Electric Company serves electricity only. They are designed to arouse desire for electric ranges, to create prospects, to build a ready market. Prospects are invited to visit their dealers' stores.

It is anticipated that many aggressive dealers in Northern California will, as in the past, tap the full force of this rural campaign with tie-in advertising. They will direct to their stores the prospects created by this Company's electric range advertising.

Identify your name and merchandising service with this campaign. Your local newspaper publisher will gladly assist you to prepare a tie-in advertisement that will bring prospects to your store.

PACIFIC GAS AND ELECTRIC COMPANY

P·G·and E·

Owned · Operated · Managed
by Californians

EW-208-832

"They Say" & Co.

. . . Business-Wrecking a Specialty

Whispering campaigns are particularly abundant—and particularly harmful—in times like these. For today people are ready to believe almost anything.

"That firm is slipping" may be idle gossip, but it might as well be the truth if you're doing nothing to convince your customers to the contrary. "So-and-So has been taken over by the banks" is the kind of rumor that shakes customers' confidence and shifts orders to competitors.

"X and Company is going to merge with" isn't good talk to get around unless you really are planning to lose your identity—in which case, who cares?

There's one sure way to keep the gossip-mongers from picking on YOUR COMPANY. That's to keep the world—and especially your customers—constantly reminded that you're not only in business, but that you're out after business.

Let your customers and competitors know that there's the same pep in your organization now that there was in 1929. Let them know that your product is just as worth buying today as in 1929. Bring out those progressive merchandising ideas. Those new and improved products. Those aggressive sales and advertising plans.

Tell the world that you know there's still 60% of the normal business to be had—and you're out to get not only your share, but a good part of the business your fair-weather competitors are too frightened to go after.

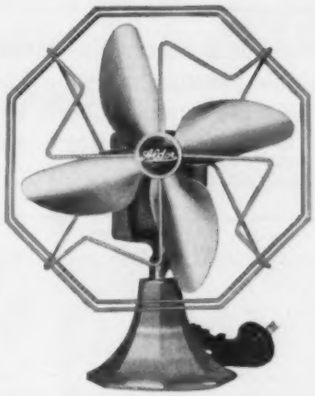
That will give your competitors something to talk about—but not the kind of gossip they'd pass on to your customers. And such advertising will leave your salesmen free to sell, instead of fighting rumors.

ELECTRICAL WEST

883 Mission St. San Francisco

HERE IT IS
A Hot-Weather Sensation

8" FAN



PRICE
NET CASH
F.O.B. Factory

$15.00 DOZ.

Send Money Order, Check or Draft With Your Order

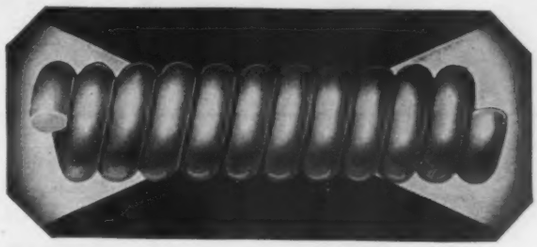
Gives Plenty Breeze. 60 Cycles—Alternating Current. No Radio Interference. Fully Guaranteed. Get in on this new item now.

The Big Flash

Beautifully Finished—Ivory, Blue, Green, Orchid.
1 Dozen to Case

Money Back If Wanted

The Aldor Corporation-Dept. D-1
2533-37 N. Ashland Avenue, Chicago, Ill.



Galvanized Telephone Wire and Steel Strand

Crapo Galvanized Wire can be wrapped around its own diameter without injury to its pure zinc coating....That is one of a number of reasons why **Crapo** Galvanized Telephone Wire and Strand can be depended upon to reduce maintenance cost.

Look for the **Crapo** Seal!

Indiana Steel & Wire Co.
Muncie, Indiana

INDIANA STEEL & WIRE CO · Crapo Galvanized · MUNCIE, IND

Crapo
GALVANIZED PRODUCTS

Merchandising Window Displays for UTILITIES

SINGLE DISPLAYS OR MONTHLY SERVICE

Velvetone Poster Co.
16 Beale Street, San Francisco, Calif.

Modern Windows for Modern Selling

ENDURO

STEEL FURNITURE

STEEL FILES
STEEL DESKS
STEEL SHELVES
STEEL COUNTERS

The Age of Steel Is Here

NEAL, STRATFORD & KERR
STATIONERS -:- PRINTERS -:- ENGRAVERS
521 Market St. SAN FRANCISCO 1169 Russ Bldg.

Electrical West is from the press of Neal, Stratford & Kerr

What Manufacturer Makes This?

Looking for the name and address of the maker of some electrical appliance? Want to know the name of the jobber or representative in your territory? Like to arrange for representation of some appliance?

All this is part of Electrical West's service. A phone call or letter to 883 Mission St., San Francisco, may solve your problem.

Electrical West 883 MISSION STREET SAN FRANCISCO

PROFESSIONAL DIRECTORY

BYLLESBY
ENGINEERING & MANAGEMENT CORPORATION
Wholly-owned Subsidiary of
Standard Gas and Electric Company
231 South LaSalle Street, Chicago
New York Pittsburgh San Francisco

ARTHUR R. KELLEY
CONSULTING ENGINEER
Reports and Valuations, Public Utility
Industrial Properties
Edison Bldg. Los Angeles

Your card here builds favorable prestige for you. The cost is extremely small. The value is great as a business aid.

ELECTRICAL TESTING LABORATORIES
Electrical Photometrical, Chemical and Mechanical Tests. Inspection of Materials and Apparatus at Manufactory
80th St., and East End Ave., New York

In any line, a specialist does the best job.
Why not consult the firms listed here on your next undertaking?

THE J. G. WHITE ENGINEERING CORPORATION
Engineers—Contractors
Oil Refineries and Pipe Lines, Steam and Water Power Plants, Transmission Systems, Hotels, Apartments, Office and Industrial Buildings, Railroads.
43 Exchange Place New York

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Only Reliable Products Can Be Continuously Advertised

3 MONARCH MODELS *with Price Appeal* PLUS

Of course you need low priced leaders! But you can only afford to sell leaders that will give real service.

These Monarchs don't LOOK like price leaders — and they give the long and economical service expected of every MONARCH. Yet the prices are right for competitive selling where price is the first appeal.

Monarchs in the higher priced class are equally outstanding in value. All are shown in the catalog we would like to send you.

Monarch

All MONARCH models are made with a *new* top finish of stain-proof porcelain in a rich variegated dark green.

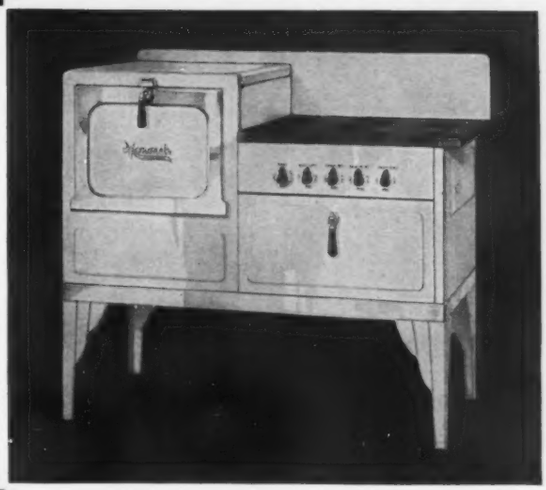
All metal parts have our exclusive Microbrite finish, an enduring chromium surfacing, ideal for stove use.

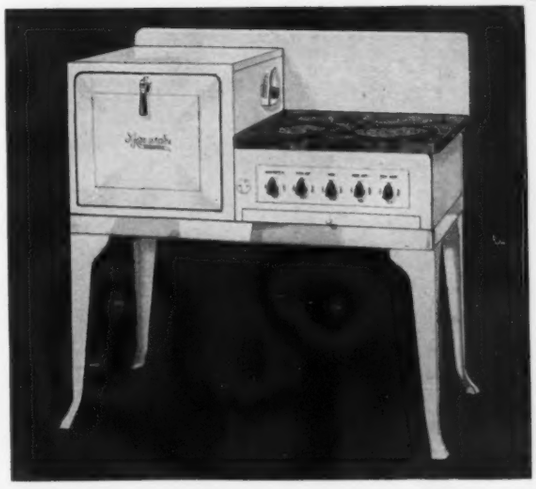
All models are made in full porcelain enamel, with most numbers in choice of white, Nile-Green or Ivory-Tan.

Models shown here are all equipped with a new type oven temperature control. It eliminates the relay — is positive in its action — and has illuminated dial strip.

When desired, all models may be equipped with an electric oven timer-clock control that never needs winding.

Monarch





Above Left—Model 17F, a low priced range with 17-inch oven, vitreous enamel lined with automatic temperature control. Full enamel in choice of white or two standard tints.

Above—Model 47F, a medium priced range with 17-inch aluminum lined oven and heat control. Also available in white or standard tints.

Left—Model 45F, 15-inch enamel lined oven. 4 surface units. Marbleized stain-proof porcelain top. A price leader of exceptional merit.

Monarch

MALLEABLE IRON RANGE CO.
311-C LAKE STREET
BEAVER DAM, WIS.
Branches in Coast Cities

Central Station Representatives: ..... **Chamblin-Thomas Company, 639 Mission Street, San Francisco, California**
Dealer Representative: ..... **Glenn L. Brown, 3515 Kempton Place, Oakland, California**
Northwest Representative: ..... **G. A. Lieser, 1218 17th Avenue North, Seattle, Washington**

Keeping the Farmer *Electrically* Alert

Safeguard the Market Value of Your Dairy Products
Let's check up on your Farm Electrification
From a $88 and ¢¢¢ Standpoint Alone
lectric Dehydration of Walnuts Pays Dividends
Pacific Coast ELECTRICAL BUREAU
447 Sutter Street San Francisco
M-15 Edison Building Los Angeles
848 Roosevelt Street Fresno

HERE are four more informative messages telling the Bureau's story of rural electrification to the farmer. You will recall other advertisements in this campaign on such subjects as portable electric motors, milking machines, electric cooking and refrigeration, feed grinding, farm lighting, etc. The small reproductions on this page show the type of Bureau Advertisements which are appearing every month in farm publications having a total monthly circulation of more than 145,000 copies. Never before has such a direct campaign to the farmer been conducted by the Bureau. This schedule of advertisements has been prepared under the guidance of the Bureau's Rural Electrification Committee, and is proving resultful, as is evidenced by the inquiries received from those advertisements which have already appeared.

Pacific Coast

ELECTRICAL BUREAU

A non-profit organization supported by all branches of the industry as an advisory bureau to serve impartially all users of electricity

447 Sutter Street, *San Francisco*

Room M. 15 Edison Bldg. Los Angeles

848 Roosevelt Street Fresno

ELECTRICITY COSTS SO LITTLE IN CALIFORNIA